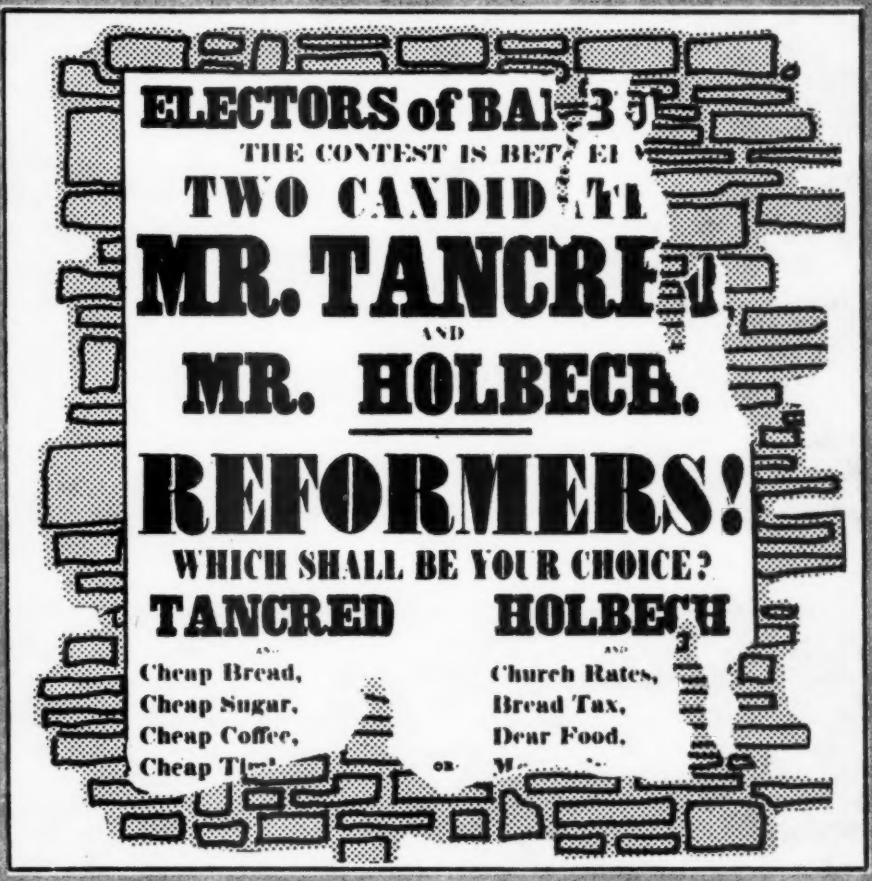
Trends in Education



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POLITICS IN SCHOOLS
Sex differences and education
Science teaching projects
The extra year
Curriculum organization in FE

Trends in Education

FEBRUARY 1975

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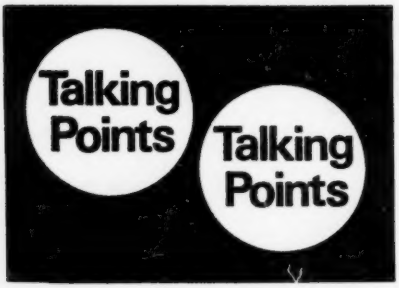

A less nation-centred curriculum

Those who teach in Scotland or Wales are well aware that there exists what could be called a United Kingdom dimension to the education they provide. In the first instance this is obviously a matter of language, but its later development involves all elements of the curriculum. Many believe that we are today as much a part of a European community (at the moment *de jure* as well as *de facto*) as are the Scots or Welsh part of the British community. It follows that the consciousness of this reality needs to be incorporated into British education.

How can this be done? We need on the one hand to know more about education in Europe and on the other to make better provision in our schools for learning about our neighbours in Europe. At present this is largely a matter of chance and choice in the secondary schools of this country. Not all our pupils have the opportunity to learn a European tongue. Some, in any case, are intellectually or from absence of motive restricted in their ability to profit from the study of a foreign language. Those who, after the age of thirteen or fourteen, continue with such subjects as history, geography, classical studies, art, or music will at least be in touch with the life and culture of Europe. But these are generally optional subjects. Conscious of these constricting factors, teachers have been moved to introduce courses of European studies, and notable efforts to provide resources for this work have been set going. These plans are generally based, at least theoretically, on team teaching or, at more advanced levels, on some form of interdisciplinary approach. How much promise is there in these developments that our traditionally insular curriculum may be modified? Do they represent the beginning of a less nation-centred secondary curriculum?

The difficulties should not be underestimated. There appear to be some serious weaknesses in the work that passes under the general title of European studies. Too often there is a tacit assumption that this kind of learning is appropriate only for the less able pupil. A proper relationship between language studies and the shaping of an introduction to the culture and social character of European countries has not yet been established. We have to face the problem that 'Europe' needs to be defined in a way that Africa or North America does not. The Europe to which we belong may be more easily identified through the eyes of the anthropologist than through those of the geographer, because our concern is less with territorial identity than with the cultural inheritance we share. For more than twenty years, under the auspices of the Council of Europe, historians have met to consider 'the idea of Europe' and in a survey of their deliberations E. E. Y. Hales has written:

> They were concerned, in empirical fashion, to draw attention to the fact that the fifteen countries that formed the Council of Europe (and they hoped one day the countries of Eastern Europe would join) owed a great deal to each other in the past and shared a tradition in religion, politics, law, art, architecture, music and the rest that was more important than any individual nation's particular experience and should be given its proper recognition.*

The outlook of someone disciplined in history is important in the debate about European studies in our schools because historians have to take a wide-ranging view and at the same time to recoil from the trivial and the ephemeral. Too many of the new courses offered to the less able pupils in our schools seem either trifling in content or log-jammed with information about institutions, particularly those of the EEC itself. The more promising developments are those in which themes or problems common to all European societies are considered. There are many such possibilities but outstandingly it is a particular kind of technological and cultural achievement that characterizes the Europe to which we belong, making it not better but different from other regions of the world. These achievements have produced the grave problems with which we wrestle today—urbanization, the high cost of energy, social disruption —as well as the heights and depths recorded in the pages of European history. The choice of themes needs to be governed by consideration of what is essentially European in the life of those amongst whom we live; and this we find in their religion or lack of religion, their use of technology, their diet, their care for children, their political ideas, their tastes in art and entertainment—to name but a few of the unifying elements.

To the traveller in Europe the most conspicuously divisive factor is, of course, language. If our aim is to extend amongst our pupils some greater sense of belonging to a community of nations, then language studies seem to be central to this purpose. This seems to demand that all pupils should be introduced to a European language, either at the primary stage or as an element of a common core to the curriculum in the early years of secondary schools.

Furthermore, it seems to follow that for political and economic, as well as educational, reasons those who enter on 'advanced' courses in arts, sciences and social sciences should possess knowledge of a modern language and a knowledge not only of our own society but of another society similar to our own.

One other problem has to be faced. The study of contemporary Europe may be useful but it cannot be equated with the study of Europe. Thus, a course which begins at some arbitrarily chosen date, such as 1945, can only be of limited significance. If the subject were ornithology or philately or jazz music, no serious student would be content to confine himself to observations and occurrences taking place only in the last twenty years. It might be a source of amusement and interest to begin learning French by noting all the words of Anglo-American origin introduced into the language since the war, but that is all that could be said for such an exercise. The common interests of the societies that make up 'Europe' are older and deeper than the events of the past twenty years. European studies must have cultural, historical and geographical foundations. In schools, therefore, such studies cannot replace the separate disciplines but only *employ* them as a means of illuminating the problems of our contemporary coexistence.

The argument for argument

Could there be such a thing as Nuffield history? The question is prompted by the appearance, in this issue of TRENDS, of Norman Booth's assessment of seventeen years of Nuffield science and of Geoffrey Petter's discussion of historical themes in the context of teaching politics in schools. It is prompted also by a Schools Council project, David Sylvester's Leeds-based enquiry into the

* HALES, E. E. Y. *European curriculum studies (in the academic secondary school). No. 8: History.* Strasbourg, 1973 (Council of Europe Council for Cultural Cooperation).

teaching of history to the 13–16 group, which puts its emphasis (says *Project Profiles*) on 'history as a subject involving enquiry about the evidence from the past'.

Seventeen years of Nuffield Science have (according to HMI reports) involved at any rate a significant minority of secondary schools in the empirical approach to natural phenomena. Some schools have tried also to familiarize their pupils with the evidence of archives and artefacts. But can third-, fourth-, or even fifth-formers be expected to do their own historical reasoning on such a basis? Logical thinking in history, according to Martin Booth (TES, 23.3.73) 'does not develop in children until towards the end of the fifth year'. Some history teachers (even some parents) would contest that, and Asa Briggs has argued that 'in relation to any syllabus the inculcation of critical attitudes is essential'.

The abiding interest in history is that it deals with people and tells stories. Children of all ages will respond to that. They only begin to grasp the historian's approach, however (as, through Nuffield, they might grasp the scientist's approach), when they perceive that there are (and must be) different views to be taken of the people and the stories of history according to the evidence and the construction put upon it—and indeed the view one takes of the nature of society. This surely is what Geoffrey Petter is saying in his article on history as an approach to politics. Young people today are exposed almost nightly to arguments on television about political issues. They argue among themselves about the political spokesmen who appear before them, and in their involvement in the history of the present they soon learn that there is no final answer. The debate continues.

If in studying the history of the past our pupils can perceive that there also the debate continues, and that there also there is no final answer, they will have grasped something both of the nature of historical study and of its relevance for the present. The Schools Council 13–16 project has still two or three years to run.* It will be interesting to see how far it heeds the reminder given by Asa Briggs that 'history has always involved debate and has always advanced understanding through controversy and argument'.

Running down education

Those who want to run down education—either by giving it a bad name or by spending less on it or both—find it useful to assert its failure in solving problems it should never have taken on. This is the conclusion of a reviewer in a recent issue of the *American Educational Research Journal* who says that the only significant failure of the schools is in solving problems embedded in the social structure. People 'interested in holding down expenditures' on education found it all too easy to exploit this alleged failure, although there was little substantive evidence for the belief that schools had recently failed and that the public had lost confidence in them. Then where did the impression of failure come from? The same writer also noted 'the slovenly way' the media reported educational events. Could there possibly be a connexion?

The writer was, of course, referring to the situation in America.

* Anyone who would like a progress report should consult the November 1974 issue of *Teaching History*, p. 354, where Roy Parkin of Chesterfield School gives a 'View from the Lower Deck'.

Politics in Schools

Whether, why and how politics may find a place in the school curriculum has become a subject of keen debate. TRENDS offers two articles in favour of this development. An historian looks down the centuries for perspective, a political scientist discusses the nature and objects of political education today.

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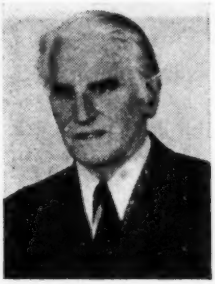
History as political education*



G. S. V. PETTER

Geoffrey Petter was until August 1974 Staff Inspector for secondary education and was particularly interested in curriculum strategy. He is now working for the Hansard Society

Education in a democratic society is concerned with the individual; its functions are to develop the personality and to initiate young men and women into adult society. Political education is one element in this process, an element designed to enhance what Professor Bernard Crick has described as 'political literacy'. This article explores one medium through which that element in the educational process can be introduced.

In this context two fields of historical exploration seem to me to be both fascinating and profitable. One concerns fundamental political change and the other the idea of a European unity.

Political change

To illustrate fundamental political change, I would suggest an examination of the revolutions in England, France, America and Russia. A turning point in the history of both England and France was the execution of a king. These two catastrophic events have one thing in common: both Charles I and Louis XVI believed, and many others believed with them, that they had been stripped of authority which was rightfully theirs and which had been taken away by powerful human agencies too strong for them. But there the similarity ends. To understand the events in England from 1603–49 is to understand what much of the political history of England has been about, whereas the significance of the death of King Louis XVI of France on the guillotine can only be grasped by reading the whole history of France both before and after that event.

* This article is based on extracts from a paper given at a conference on European cooperation held at Rome in October 1974. The conference was organized by the Instituto della Enciclopedia Italiano.

The notion that the law was above the king was totally unfamiliar to King James VI of Scotland when he became King James I of England. The concept of the Divine Right of kings was perfectly respectable in civilized, European circles; thus King James and King Charles I refused to acknowledge that the right to legislate rested ultimately not in the king, but in the king in Parliament. And the English Parliament was, first and foremost, a court of law.

For the student of politics, therefore, the history of England in the seventeenth century—the struggle between King and Parliament—should be compulsory reading because students must decide for themselves between the conflicting claims of absolutism and government by consent. Or put more simply—do I want a government which will force me to obey it whatever it does, or do I want, at some stage, a say in how I am governed?

The French Revolution represents the first large-scale attempt in Europe to create an alternative society. Whereas Plato's Republic and More's Utopia represent ideal states to be contemplated as models, the notion of the alternative society, equally idealistic, is based on the notion that everything that is established custom is rotten and must be replaced by something which, however vague the goal may be, must necessarily be worked for and ultimately achieved.

It is impossible to trace the events leading up to the storming of the Bastille in 1789 without any reference to political thought. After all, France was the centre of political thought in the eighteenth century. The men and women who created the climate which made revolution possible were inclined to be doctrinaire and unhistorical, and many of them became the victims of their own enthusiasms. These enthusiasts knew practically no history, but they knew about the political and social conditions of their own time and they read copiously about political and social theory. All sorts of creative writers turned their hand to political thought. Voltaire and Rousseau belonged to the world of literature; Diderot was a scientist; Turgot was a civil servant; Holbach was a metaphyscian. Montesquieu alone attempted a systematic, historical approach, and that part of his work never became popular in his own day. What characterized these thinkers was that they produced what was in effect a new science of government which, by recognizing the few simple principles upon which human institutions ought to be founded, would sweep away the corruption, the confusion and the injustice evident to thoughtful intellectuals. But they did not envisage catastrophe and bloodshed —least of all a reign of terror. Nor did they know—indeed they could not have known—that the prominent characters who were to dominate the scene in the years 1792–94 were men unheard of when the States-General met in 1789.

Perhaps the most important comparison to make between the English and the French revolutions is that whereas the struggles

of the seventeenth century were about liberties in the plural, the upheavals in France were about liberty in the singular. In the one case the objective was limited, not defined in detail. In the other case, the objective was in reality vague though there was no lack of definition in theory. But in making the comparison, it must not be forgotten that between 1688 and 1789 an immense revolution in the whole process of thinking took place. It is fascinating to reflect that John Locke, whose two essays, published in 1690, were written to uphold and defend the glorious revolution of 1688, became one of the deeper influences in the French thought in the eighteenth century.

Like the events in England in the seventeenth century, the revolt of the American colonies was a revolution only in retrospect. It has in common with both the English and French revolutions that it was concerned with grievances; but, unlike the events this side of the Atlantic, it created something quite new—it led to the building of a new nation. There are a number of important aspects of the revolt of the American colonies and of the creation of the United States of America that are important for the student of politics. For instance, the American colonies grew up as a result of private enterprise, and this spirit of individual and collective enterprise was the driving force behind events which precipitated the break with the mother country and of developments which took place in the nineteenth century. Again, the American revolution, looked at in retrospect, derived its idealistic principles from France and its sense of legality from England.

What was significant was the creation of a new nation with a written constitution. Inasmuch as it provided guarantees for the citizen, this written constitution could be described as democratic, but American democracy thrived on what had paid off: enterprise, initiative, the pioneering spirit, the acquisition of land, the amassing of wealth; above all, the notion that when a man pursues his own interests in an enterprising fashion, he will tend to raise the standard of living enjoyed by all.

The study of political change in Russia is of a quite different order from the others we have considered. The difficulty lies in the fact that although the course of events leading to the creation of the USSR contains elements immediately palatable and comprehensible to the young student—for instance 'Bloody Sunday' of 1905 and the general strikes of 1905 and 1917—neither the theories of Marx and Engels nor the policies of Lenin, Trotsky or Stalin can be put into proper perspective except against the total background of Eureopean history.

There are, nevertheless, parallels and contrasts to be noted. For instance, in both France and Russia, an autocratic government was prepared to adopt, at times, a conciliatory posture. In both countries warning notes were sounded by thinkers and writers years before the crisis came. In neither country did the catastrophic events of revolution produce the results which had been

hoped for or expected. These are examples of parallels; now for the contrasts. The idea of revolution as a technique for affecting political change was, as it were, invented by leading figures of the first French revolution as they went along; the Russian revolutions of 1905 and 1917 were based on systematic theories owing most to Marx and Engels, though neither were acknowledged at the time to be the mainspring of inspiration. Again, the Russian revolution can be compared with the English revolution in that the former set out to destroy and reconstruct and the latter to preserve. Meanwhile, to make one further comparison, the Russian revolution produced a communist society and the American revolution a capitalist society.

For the young student of politics, the ability to distinguish the meanings of the two words 'power' and 'authority' is fundamental. The four revolutions illustrate the use of power to put authority into what was believed to be the right hands.

The European background

It is equally important that the student understands the relationship of the individual to authority. The study of the concept of European unity may seem a far cry from this; yet, as a European, I find it necessary if I am to understand how I, as one individual unit, fit into the community of my country, now considered part of a larger European community.

If we look at the mediaeval world through the eyes of Dante or Thomas Aquinas, we can see that their political thinking had a common basis and contained two germs of disintegration. First, conflict of authority. The idea of *plenitudo potestatis*—the omnicompetent monarch—worked only if the monarch were divinely inspired. St. Thomas and Dante proclaimed, respectively, that the plenitude of power belonged to the pope or the emperor but not both. Second, a deeply rooted notion that the will of the people was the source of temporal power.

Disintegration came with the Reformation and the growth of the nation state. But if we think forward in history, that is approach the fifteenth and nineteenth centuries via the thirteenth and fourteenth, rather than looking back at them from the twentieth, perhaps the most interesting phenomenon in the history of Europe is not what changed but what did not change. Religion remained the principal driving force; authority, by and large, remained centralized and absolute. The idea of government by consent had little practical meaning because only a small minority of men and women were either articulate or literate enough to do other than to obey. Only the Anabaptists of Münster took the notion of national sovereignty to its logical conclusion by asserting the sovereignty of the individual conscience. Above all, the concept of law, whether it be the law of God or of man, remained deeply embedded. Indeed, the political aspects of feudalism hung on long after its economic foundations had been eroded.

The great change came in the eighteenth century—the period during which reason began to replace religion as the criterion for personal conduct, and power finally superseded legality as the criterion for political action. It was also the period during which the craftsman became the self-conscious artist. From these subtle changes slowly emerged the individual as we understand him today: a man or woman capable of thinking in terms, not just of freedom from slavery, from persecution or from poverty, but of positive freedom to choose a life-style, a point of view, a political creed, a religious belief or a moral standpoint.

Modern politics

In preparing young people to enter the world of work, and the business of earning a living and of spending time, we are preparing them equally to be members of the electorate. Just as we try to give pupils every opportunity to explore opportunities in the fields of the professions, industry and commerce or in higher educational studies, so we have a duty to help them, in the political sphere, to understand what choice there is for them, the implications of decisions which they make and the degree to which, inevitably, they will have to adapt to conditions as they find them. The historical approach may have given them some insight into the use of power to exert authority or to overthrow it. History books tell us something of the nature of power perhaps down to as late a date as 1848. But in the contemporary scene, the nature and meaning of power needs to be redefined.

I would suggest that the power that men and women, either collectively or individually, can wield is basically of three kinds:

1. power over the means of production;
2. power over the means of destruction and annihilation;
3. power over the means of communication.

This may involve consideration of capitalist as opposed to communist systems; of violence as opposed to non-violence as a means of obtaining an end; or of the influence of the mass media, in particular radio and television.

If the aim is to make a student politically literate, that is to enable him to understand choices open, decisions to be made and the degree of adaptation necessary, what are the objectives? If we live in a Marxist state or under a totalitarian regime, our objective is perfectly clear—to understand the virtues of the system under which we live and to accept our duty to abide by them. If we live in a democracy, our study of the revolutions in England, America and France will have taught us three traditional maxims: 'freedom under the law', 'life, liberty and the pursuit of happiness', 'liberty, equality and fraternity'. Is any indoctrination permitted to us? In England, we sometimes sing our national anthem and most of the children learn it. In France, boys and girls may well grow up accepting the notion of 'Vive la France'; in America, all school children salute the flag. But none of this has anything

to do with democracy; it has to do with a titular loyalty to a monarch, a country or a flag.

The trouble is that the philosophic foundations of democracy are vague and elusive. As a word it gives a certain respectability to any political creed. If it means a state of affairs in which power in theory lies with the whole people, who delegate some of their number to act for them, investing them with the authority to make laws, where does power really lie? On the other hand, if a strong central government controls the means of production, the means of destruction and the means of communication, using them in the name of the whole people, for the good of the whole people, power certainly lies with those who wield authority; equally, the system is not democratic. The only way out of the difficulty seems to be to say that the word 'democracy' serves to describe a state of affairs containing a guarantee against tyranny. But the guarantee is only against political despotism; there is no automatic guarantee against the tyranny of wealth, fear of unemployment, physical disablement, or against falling a victim to the power of mass media—either the newspaper, the radio or television.

What can with justice be said about democracy, whether based on the rule of law or on the vague assumption that the majority is always right, is that it tends to polarize opinion. The elector can be overwhelmed by the multiplicity of expert knowledge in the fields of economics, sociology, and psychology, and is at the same time liable to become confused by the conflicting arguments of politicians seeking electoral support and of experts anxious to vindicate their own particular expertise.

At the same time, we have in present-day Europe the most articulate electorate that has ever existed; and for this we have to thank not only state education which has produced basic literacy, but the mass media whose blandishments, reassurance or sensational warnings are so potentially powerful. Herein lies the most powerful argument for acquiring 'political literacy'.

The role of the teacher is to demonstrate what I would call the mechanics of faith. What the general public fears most about political education is the danger of indoctrination. The antidote is an understanding of the way in which a person comes to embrace a creed, whether it be religious, moral or political. There is a difference between blindly pledging one's loyalty to a movement and offering one's support after reasoned consideration of the matters involved. Teachers are in a unique position to demonstrate the difference between a faith based on reason and one springing from prejudice or from the persuasion of others. In my view, a teacher is entitled to make known his or her point of view, explaining the reason for it, always provided that alternative views and postures are explained as well. For a teacher to proselytize deliberately is grossly unprofessional: for a teacher to explain his or her own position is not only the greatest guarantee against indoctrination, but establishes a fuller and richer relationship with

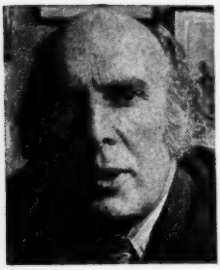
the pupils. Let it never be forgotten that if the schools and other educational institutions fail to teach the mechanics of faith, no one afterwards is going to bother to do so, except for the specific purpose of indoctrination or canvassing support.

By the teaching of the mechanics of faith I mean simply this: first, the identification of the principles involved and the consequences in practice of holding them and acting upon them; second, comparing the set of principles in question with others seeking the solution in a different way and with different consequences. The choice lies with the pupil. The function of the teacher is to help him to learn how to make it.

Political literacy for all involves the introduction of a basic programme before the age of sixteen in order to help young students to be something more than merely articulate. This objective can only be reached by cooperative effort by teachers who are expert in several disciplines. Many teachers may feel that the short-term goal can best be reached by using contemporary history and with the aid of the sociologist and the economist. It may be argued with some justice that the study of four revolutions and of the vicissitudes of European history is more appropriate for the gymnasium than for the earlier secondary stage. This is a matter for discussion. In the longer term, I would hope that all future members of the electorate would, as a matter of course, continue their political education until they become legally independent.

Although contemporary problems can be made most immediately relevant to students by reference to contemporary events and personalities, time past is of no less importance than time present if problems and alternative solutions are to be presented in proper perspective. An English scholar, Derek Heater, has suggested a range of political concepts which the study of history can illustrate; they include ideas, administration, leadership and decision-making, the role of the individual, techniques of change and conflict. In the highly personal view which I have taken of certain features of European and American history, each of Heater's concepts finds a place. Other thinkers may express concepts in a different manner, and other teachers may choose to use historical material in ways which contrast radically with mine. The economic historian, for instance, will quarrel with most if not all of my thesis. But in a democratic society, we are permitted to quarrel, to argue, or more courteously, to question each other on points of detail. What is of fundamental importance depends on reconciliation and compromise, so we have the opportunity and the duty to initiate our students into the art of analysis and discussion of problems; to the skill and knowledge needed to develop intellectual discrimination, and to the forbearance and tolerance absolutely necessary to wise decision-making in a democratic society. Most history is the history of unwisdom; but it is better to be wise after the event than never to get wisdom at all.

Political education today



BERNARD CRICK

Bernard Crick is Professor of Politics at Birkbeck College, University of London, chairman of the Hansard Society's working party on political education, and Honorary President of the Politics Association

Politics as a subject of disciplined inquiry has no need to hide its light furtively under a bushel, nor to find melodramatic excuses for being taken seriously and forming part, as Milton said it should, of the education of the whole man. Its antecedents are good, fathered by Aristotle as the supreme union of practice and philosophy; and if some of its children are a little delinquent and embarrassing in their behaviour, well, it is widely admitted to be better in theory than in practice—which is as much as can be hoped from any education that remembers that it is part of life, an important part of life, but neither a substitute for life nor a full adequate protection from life.

Civilized life and organized society depend upon the existence of governments and while governments cannot, however wise, dedicated and popular they may be, make us good and make us happy, they can effectively prevent our betterment. To take a Greek or a Jacobinical view of the matter may now appear to go too far: that a man is only fully a man when he or she is taking part in public life. But it remains true that we think less of a person who either has no public spirit or is so fastidious that he will not take part in all those jostlings of interests and ideals that constitute politics. There are no clear grounds for saying that society would be better if everyone took part in politics; however, there are overwhelmingly clear grounds for saying that societies are bad which prevent or even merely discourage popular participation; and there are reasonably clear grounds for thinking that distaste for or distrust of politics can threaten any kind of just and tolerant life.

Politics is concerned with the creative conciliation of differing interests, whether these interests are seen as primarily material or moral. I say 'creative conciliation' to try to convey that in the political tradition we try to resolve disputes as well as possible and as far as possible, but we never hope to resolve them or to solve them utterly. The world is like that. It is extremely unlikely that there will ever be societies in which disputes about the allocation of resources based upon differences as to values will not exist.

I start from this abstract but basic perception of politics simply to show that the first task of any possible political education that

is of educational value is to convey some sense of the naturalness and variation of politics. This is not quietism. On the contrary, we may *not* have the poor with us for ever; but even in a society of equals, it is likely that political disputes will continue.

Educational value

Hence the political part of education is primarily, as in any possible moral education, an education in what differing viewpoints are held, who holds them, why, in what context and with what restraints. This may sound platitudinous. But how often is political education, if approached at all explicitly, approached primarily through a study of constitutional rules and institutional forms. The cart is put before the horse. Those rules and institutions which exist because there are disputes and issues are thought to be prior to those disputes and issues. The British Constitution is only meaningful as a summary of the way we contain pre-existing, actual problems; it was not something either given to us by King Alfred or Gladstone, nor yet invented like croquet; rather it developed, like football, to such an extent that it proved convenient to have generally recognized rules: but these rules are derived from the practice, they did not make the practice.

Taking constitution before issues is worse than an intellectual mistake, it is a kind of educational crime. For an interesting subject, indeed one that many head teachers plainly still consider too contentious to be touched (or touched properly), is rendered utterly boring; and it can be rumoured (though statistically not true) that GCE A-level British Constitution is a soft option. (In fact, nearly all these syllabuses are now on the way out: 'British Government and Politics' is the more common and usually accurate formula.)

However, GCE exams are not the main point of importance. I am here concerned with trying to define the nature of a minimum political element in all education, not staking out another territorial claim for the already grossly overcrowded timetable, particularly for the more able alone.

Politics as the perception of differing interests and differing justifications about the allocation of resources within, or the direction of, society, crops up all over the place. History is involved in politics at every step. Geography will, through environmental and local studies, necessarily touch on the political factors. English Literature has a distinctively English involvement in social and political issues (if Orwell's *Animal Farm* is not, as yet, compulsory under some new reading of the 1944 Act, it is, in fact, universal); and Use of English draws heavily on social and political materials in the attempt to find motivation to enhance language skills. Economics begins to retreat from a perhaps excessive mathematical abstractness back to its fertile, Scottish origins as 'Political Economy'. And, of course, a good deal of explicit discussion of political and social problems already takes place in many of those

hours variously designated 'Social Studies', 'General Studies' or that ever-deceptive 'Free Time'.

The question is not really whether it is done at all, but whether it is done well or done badly. It should be done: there is no need to fear to touch what is one of the greatest parts of our cultural heritage (even if one still the least fulfilled in terms meaningful to the many) because of fears of bias or indoctrination—of that in a moment. I believe, however, that it could be done better. Certainly in General Studies or Social Studies there is a tendency for politics to be treated somewhat as 'one damned horrible problem after another'. (As a teacher friend of mine cheerfully remarked, 'Abortion last week, police this week, parliamentary reform next week'.) There is need for some greater professionalism—even on such a simple level as knowing how to establish what are commonly thought to be the main political problems and viewpoints. There is need for greater system—some basic set of concepts should be used with a reasonable consistency. There is need for some small core of political education to be part of teacher education at every level (all children become citizens, as well as workers, husbands, wives, parents and pedestrians; all of which can find some place in the curriculum). There is need not so much for, if at all, an extension of time-table hours in Politics, as for helpful booklets, teaching notes and resources which will help the existing teacher of subjects (or children) to enhance the political literacy of children at school through what they are doing already.

The fear of bias

The neglect—I think it is fair to use the word—of civic education in this country,* despite the fame of our parliamentary and representative institutions and our current worries about their working, has much in common with the neglect of sex education. Both a moral and a commonsense feeling of need have usually been overborne by a sense of the risks involved. So it has either been ignored, left to the individual initiative of brave or foolhardy teachers or else officially reduced to the boredom of anatomy; I mean 'Brit. Con' which is not what *anybody* wants at all.

Bias is, to some extent, not merely probable, if we are moral beings, but unavoidable. I say this as a political philosopher.† For while I share the fears of some LEAs that there can sometimes be gross bias in the classroom (whatever the subject), I do not share the hopes of some educationalists that methodologies can be produced which are guaranteed value-free and will eliminate

* See HEATER, D. B. (editor). *The teaching of politics.* London, 1969 (Methuen Educational), pp. 1 - 21. T. Brennan's *Political studies: a handbook for teachers* (Longmans, 1975) also contains invaluable practical information and aids.

† See my 'On bias', *Teaching Politics*, May 1972; and SNOOK, I. A. (editor). *Concepts of indoctrination: philosophical essays.* London, 1972 (Routledge and Kegan Paul), and his simpler *Indoctrination and education* (Routledge and Kegan Paul, 1972).

bias (in three terms or your money back). One should be dispassionate, rational, sensible, in a word, professional and responsible; but nothing can guarantee that one can be without bias. To think otherwise is self-deception. And it may not even be a sensible desire. For there is bias and bias. Every teacher should be aware of his or her own biases, and being aware of them, they redouble his empathy for the plausibility of other biases. Such bias is human, venal, inevitable and actually educational. At some stage the teacher does have to convey that these things matter. While there are classrooms, we cannot destroy example. But bias of a kind that excludes the plausibility of the other viewpoints, often by not recognizing one's own bias, is indefensible. And teaching can actually go beyond 'mere bias' into positive indoctrination (whether conscious or unconscious) if something is taught as the truth regardless of consideration of evidence and if the pupil is not introduced empathetically to alternative viewpoints *and* alternative sources of evidence or information.

No one has a monopoly of bias. Socialists of fifty-seven varieties (or fifty-eight counting myself) who go on teaching 'It's all a racket' and 'What should be done about it now' (in company time) are no more or less a nuisance to genuinely educational values than the Tory who avoids all discussion of political problems, sticks to the constitution, believes that he is (as the German army in Weimar used to say) 'above party', but calls 'constitutional' all his own prejudices about the virtues of traditional order and the dangers of change. Liberals are, of course, above it all, except that occasionally by teaching that individual participation and institutional and electoral reform will solve all things, they unwittingly create in the name of civics a deady brew of disillusionment with the past coupled with a perfect guarantee of perpetual frustration in the future.

Politics is about conflicts and alternatives and acceptable ways of resolving or continuing them. So we start, whatever our personal bias, by identifying what the main issues of our society are *thought to be*. We should show who holds different views and why and draw the class into all this, particularly to imagine or reconstruct the justifications and motivations of people holding viewpoints other than their own. At every level, the first main task is to create empathy, to create an understanding of the plausibility that every pupil is likely to encounter in his life, and how these viewpoints define not merely objectives but priority among problems too. That 'willing suspension of disbelief' of which Coleridge spoke as constituting poetic faith is called for every day in politics and political education. If this kind of knowledge is created, then problems of bias become far less acute. Many would feel that we have done our main business as educators of citizens if they can understand what the issues are commonly felt to be, who holds what viewpoints, why and what reasons they offer.

Political literacy

An empathetic knowledge of differing viewpoints is, however, not enough. Plainly if we want citizens, we have to put up with some of the unpredictable inconveniences of action and participation. We have to teach or let the pupils learn skills relevant to political action. Perhaps it is gaming and simulation, perhaps it is just old-fashioned debates, or perhaps it is some voluntary share in communal tasks. A political education is *something* to do with the whole organization of the school, but I am sure it is not re-organizing the whole school. *Informed* participation, not any old participation, is needed. Schools have to teach. Appeal to the imagination of the pupils as well, for their experience is limited. Perhaps an experience of something like politics can be created in small groups, even in schools. But many of the factors of national politics will necessarily be lacking. An American professor said to me that the High School, he thought, should be itself the model of a participative democracy. I remarked rather sadly that I couldn't see how one could build into a school model the factors of Watergate: 'The head teacher gets his job by . . . . and brings into the school with him . . . '. Fortunately political socialization research does tell us something. It tells us very clearly that the basic social factors conditioning children's partisan political attitudes are far more present outside the school than within. I often argue with teachers that they should neither fear to influence nor hope to influence political attitudes; but that the school may have a great effect on two things far more important than a proclivity to vote one way or the other: not *what* the biases are, but *how* they are held; and if I perceive injustice, am I equipped to and temperamentally likely to try to do anything about it?

All I feel fairly certain about is not that political values can ever be inculcated by any form of school organization (deliberate indoctrination seems more likely to cause apathy and cynicism than enthusiasm); but that some practices in schools can negate political values. If it is obvious to the pupils, for instance, that the head never consults with his colleagues, or habitually interrupts a lesson in progress (perhaps on Civics) without so much as a 'by your leave' or 'May I just . . . '. Rare but occurrent.

So *knowledge* is needed, participative *skills* should be enhanced, but certain values may need to be encouraged also. I would distinguish as carefully as possible (but it is difficult) between *procedural values*, which are necessary if there is to be tolerant political debate at all, and *substantive* values, which are the doctrines of politics involved in the cut and thrust of debate itself. Freedom, toleration, fairness, respect for truth, and respect for reasoning seem to me to be procedural values that must be espoused directly; they are preconditions both of any genuine education and of political democracy; they limit the possibility of indoctrination; they are on a different level from those sub-

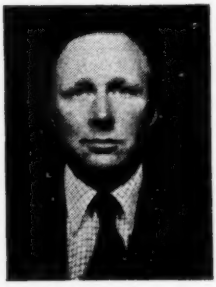
stantive political values like equality, individualism or order, or those substantive doctrines, like socialism, liberalism or conservatism, about which the pupil should learn to be empathetic. These latter are, of course, also values; but in the classroom they can only be treated and assessed as opinions.*

If a person has a fair knowledge of what are the issues of contemporary politics, is equipped to be of some influence, whether in firm, factory, voluntary body or party, and can respect while not sharing the values of others, he may deserve to be called politically literate. There is some sense in making political literacy a general educational and cultural goal. Obviously political literacy, like general literacy, is to some extent functional. It must be applied not as a general formula, but in relation to the abilities, concerns and situations of very differing people. Some such moves are long overdue.†

Trends 1975/1

Sex differences and education

The basic differences between the sexes are, after all, genetic rather than social or cultural. What are the implications of this simple fact for teachers and learners?



JOHN BRIERLEY

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'The difference between the two sexes, man and woman, is one of the most fundamental facts of life, physiologically, and socially, intellectually and historically. It is a totally genetic one, incapable of being effectively modified by the environment. Light and darkness, teaching and feeding, do nothing to change it. It depends

* See my 'Basic political concepts and curriculum development', *Teaching Politics*, January 1974, pp. 13 - 24; D. B. Heater, 'Political concepts and the construction of a syllabus', *ibid.*, September 1973, pp. 2 - 13; and Ian Lister, 'Political socialization and the schools', *ibid.*, May 1973, pp. 2 - 17.

† See the working papers of the Programme for Political Education, sponsored by the Hansard Society, 12 Gower Street, London WC1 (in conjunction with the Politics Association) and aided by the Nuffield Foundation. 1. 'An Explanatory Paper'; 2. 'Political Literacy'; 3. 'Basic Concepts'. (Available on application to the Hansard Society.)

upon a piece of chromosome having a certain genetic structure. In a thousand years we may know analytically what the structure is. More likely not.' This was written by the geneticist C. D. Darlington* in 1971. What is the evidence on which this statement rests and what are the implications of the evidence for education?

XY chromosomes

In essence the sex differences depend upon the presence of a Y sex chromosome possessed by men but absent in women. Long before birth this chromosome delivers a message which organizes male development and sexes the brain. In the absence of a Y the foetus develops relentlessly according to the female pattern. Eve, so the Old Testament says, was made from a rib of Adam, but maleness is carved by the Y out of a basically female pattern.

As indicated, the chromosome outfit of men and women differs slightly. Each has forty-six chromosomes in every living cell of the body. Each chromosome is one of a pair, identical in appearance with one exception: the pair associated with sex determination in the male. This pair of chromosomes consists of a larger chromosome, the X, and the Y which is about a third as long as the X. In women the sex chromosomes consists of a pair of Xs, identical in appearance. The other twenty-two pairs of chromosomes are the non-sex chromosomes. Each of the forty-six chromosomes carries in it a genetic code for the future development of the individual. The chromosomes, then, carry the dowry of heritage from father and mother.

Sex development

The agenda of sex development set out by the chromosomes is worked through in two stages. At first the foetus is neuter but by the end of seven weeks the sex organs are recognizable, male XY, female XX. Once the foetal testis is formed, it produces at about the twelfth week the male sex hormone which acts as a chemical signal to sex the hypothalamus, altering the growth and pattern of certain nerve cells within it. The hypothalamus is part of the brain; its job is to regulate the glands and part of the nervous system.

In adolescence through the action of the pituitary gland, which takes its cues from the hypothalamus, the monthly waxing and waning tides of hormones are started in the female; in the male the non-rhythmic pattern. This second phase of sex development depends on hormones produced by the ovaries and testes. The hormones may differ in quality and quantity from individual to individual. They are not dependent solely on the simple X-Y trigger but on variations in the gene-outfits of all forty-six chromosomes. It is this variation that prevents sharp male-female

* DARLINGTON, C. D. A scientist replies. *Encounter*, 1971, **37** (6), 84 - 93.

differences to give an overlap between the sexes in secondary sexual characters, temperament and probably intelligence.

Besides the hormonal sexing of the hypothalamus there are other sex differences in brain development. Though the sample is small, brain analysis shows that there is a difference between boys and girls in the speed of nerve development in the left and right hemisphere of the brain cortex. The areas responsible for speech (in the left hemisphere of the brain) are much more advanced in girls aged four than in boys of the same age. Parallel with this, the speech organs of girls are more developed. In boys the right hemisphere is more developed and this is the region that may facilitate the development of spatial skills. On this point there is considerable evidence that the normal human sex differences in visuo-spatial abilities is at rock bottom under the control of the sex chromosomes. Sufferers from certain sex chromosome abnormalities, while normal in verbal IQ tests, are very poor at tests involving shapes and patterns; this is sometimes so severe as to be popularly known as 'space-form blindness'. There is also evidence that sex hormones carry the chromosome message to the brain to influence spatial ability.

Evolutionary significance of the sex differences

In terms of the sex chromosome outfit, therefore, man is the 'hybrid' sex. He has about two-thirds less chromosome material in one pair of chromosomes than woman, who is evenly balanced in her X chromosome set. Dr. J. M. Tanner's account* of the human growth curve should be read for a masterly account of the sex differences in physique, physiology and strength. Basically, however, up to the age of thirteen the muscular strengths of girls and boys are about the same. After thirteen, the performances of boys and girls diverge and, by sixteen, boys are considerably bigger and stronger. In evolutionary terms, the male becomes at adolescence more adapted to such tasks as hunting, fighting, and manipulating all sorts of heavy objects as are necessary in some forms of food gathering.

The imbalance of man's sex chromosome set is likely too to be the base of his great variability compared to woman. Boys are more easily thrown off their normal growth curves than girls, probably because the two X chromosomes of girls provide better regulating forces than the one X and the small Y. Men on average see better, but women hear better and are more sensitive to touch, pain and smell.

The diversity of man also shows up in cognitive differences. Men contribute more geniuses to the population than women but also more criminals, defectives, suicides and stutterers. Whatever characteristic is being tested men are 'more so' than women. In the Cambridge University tripos examinations between 1920 and

* TANNER, J. M., *et al. Human biology*. London, 1964 (Oxford).

1952 men gained the highest percentage of Firsts and Thirds, women again the largest proportion of Seconds. Even in English, despite the fact that women score better in verbal tests, men gained proportionately more Firsts and more Thirds than the women, who scored the highest number of Seconds.

The greater averageness of women and variability of men has evolutionary and adaptive significance. Twentieth-century man and woman can be compared to the last few sentences in the very long book of human evolution. For one or two million years the male was the hunter and protector of the family until its members could protect themselves. In evolutionary terms this means the male was required to respond to highly variable opportunities and stresses; he needed to fight, hunt, take risks, be exploratory and cooperate in groups for survival. He needed high-speed muscle, low body fat, good vision and sense of direction. The female cared for the baby through its early years of life. She perhaps was the one who transmitted the culture and the language and stayed put. In her, the greatest stress of natural selection was likely to act on factors that favoured survival during the reproductive period, where survival of the species was a matter of two people, mother and foetus. Biologically it would be an advantage for the female to be built on average lines as she would be more certain to survive in primitive conditions than an extreme variation from the average type. Female 'averageness' therefore seems to be an evolutionary left over from the time when the environment was tough, as also is the fact that the greater proportion of human variability resides in the male. Civilized man and woman cannot shake off the effects of 40,000 generations of natural selection and genetic adaptation which make man and woman complementary but equally valuable. Like their forebears, for the majority of women now, the business of home-making and the early rearing of children is a big part of their lives while for men the equivalent is to earn enough to support their wives and families. But that is not to say we can risk leaving undeveloped the mind of anyone, male or female.

Differences and education

There are perhaps three basic issues. First, to remember that the effect of the total chromosome outfit and the quantity and quality of the hormones it triggers into action is to cause sexuality to lie on a continuum: all men have some degree of femininity and all women possess some degree of masculinity. Second, that in any discussion of differences, the thorny area of upbringing and heredity is entered. The relative importance assigned to these two components depends often on the political leanings of the assessor: we can simply say here that heredity and environment interact in the production of each and every character and we cannot say how much has been contributed by either. In other words,

heredity determines our potentialities but the environment determines which or how much of those potentialities shall be brought out during development. The idea of fixed abilities, 'heredity 80 per cent, environment 20 per cent', is nonsense. Third, that comparisons between one group and another—men and women—bring out average differences and their magnitude. As a result, specific questions can be asked about such differences. Such questions are asked because there is social demand for programmes that concentrate on group handicap. But the quite necessary concentration on 'average' differences should not divert attention from the biological fact of the uniqueness of the individual and the need to treat different people differently so long as each is treated as well as possible. Dr. Johnson put it more plainly when asked, 'Which have the most brains, men or women?', he replied, 'Which man, Sir, which woman?'

Young children

The outward manifestation of differences in brain development referred to earlier is shown by observations of young children; girls are verbally more fluent than boys from the start of articulate speech, and at about four boys may be three or four months behind girls on the road to adult speech. Whether this difference is lasting or merely a lag that is eventually overcome is not clear. Because girls pass through more of their formative period than boys by age five, language deprivation may hit them harder. But what is important for both boys and girls is the need for a good language environment at home and school, to nourish the developing brain which is programmed to mop up language.

While girls are superior in verbal fluency, boys excel on average in spatial ability. Tests which involve proficiency in the manipulation of spatial relationships show that males, both adults and children, from the age of two are superior to girls. Men clearly do better in occupations that require a high level of visuo-spatial ability, such as engineering and architecture, though there are notable exceptions—crystallography, for example. We have seen earlier that it is very likely that visuo-spatial ability is under the control of the sex chromosome—hormone machinery and has its roots in right hemisphere development of the brain. For practical purposes at school these findings strengthen the importance of systematic exposure of girls to early experiences with toys, sand, water and boxes which introduce numerical and spatial relationships, for doing so might well improve mathematical ability later on. Unless it is disproved, we should work on this hypothesis.

Exploratory activity varies between boys and girls. The male is certainly more exploratory than the female. Boys of between three and five are actively exploring and manipulating the environment while girls are becoming increasingly skilled in verbal and social functions and occupied in sedentary activities like crayoning, cutting-out and plasticine work. These observations are true

too of a whole range of primates other than man; infant male monkeys are 'doers', female 'watchers'. Such differences again may be brain-based and rooted in the evolutionary adaptations referred to earlier.

For practical purposes at home and school, it is important to understand that exploration is a valuable biological drive. Even a one-year old is capable of highly sophisticated exploration which is simply the application of the scientific method to his environment. He learns the nature of things by experience, he draws his conclusions, then he tests them. This form of building up knowledge of the world through trial and error is the basis of all later intellectual activity. For *all* children arousing and stimulating interest by creating an environment that invites exploration is sound practice. This concept is supported by the fact that the developing human mind is extremely flexible and open compared with that of other animals. Genetic evolution has left man with only vague instructions for most behaviour. This 'open-mindedness' has survival value because people need enormous adjustability and mental resiliance to cope with a fast-changing environment. By contrast, animals grow up in environments little or no different from that of their parents. Their behaviour development is more closely determined genetically to fit them to their environment. For sound development the young human depends on an environment he can learn from by exploration and interaction.*

Schools and undergraduates

With older children Cyril Burt's inquiries with gifted London school children showed sex differences in reading matter and hobbies. Boys' hobbies included building complicated meccano models and radio sets; girls liked painting, drawing, and writing poetry. All of this could be explained by upbringing and tradition. But the facts tie up with brain differences and with the findings of spatial and diagrammatic tests mentioned earlier. Notable too is the link that seems to exist over the choices of subject in secondary schools or universities. Thus boys taking O-level physics in the 1972 summer examinations numbered 47,846, girls 11,997; chemistry 36,156 boys, 14,611 girls; biology 31,243 boys, 56,852 girls; history 34,806 boys, 39,131 girls. In university admissions in 1972 in England and Wales the same bias is shown: arts (including languages), 5,422 men, 6,898 women; pure science, 10,758 men, 4,103 women; engineering and technology, 8,097 men, 285 women; and architecture and planning (spatial abilities?) 549 men, 180 women. Of the sciences, biology is the exception, girls outnumbering boys in examinations. This might be because the subject is life-based and less mathematical than physics and chemistry. It might be due to lack of curricular choice or a combination of all three factors.

* TINBERGEN, N. The importance of being playful. *Times Educational Supplement*, 10 January 1975.

Are such differences due to our specific culture? We shall not be able to answer this question adequately until women have had strictly equal vocational, social and educational opportunities for many generations. At present their inborn gifts do seem to equip them for arts subjects. A comparison of similar figures with those from Soviet Russia indicates that our differences might be largely cultural. In Russia, where women have more equal opportunities, about a third of the student engineers are women. But despite education, the home influence for generations might powerfully support Dr. Johnson's well-known dictum that 'a man is better pleased when he has a good dinner upon his table than when his wife talks Greek'. Research findings, at present tentative, will need to give us firmer clues to the intellectual and emotional differences between boys and girls, before we can judge whether differences are due to upbringing and tradition. Careful analysis of the achievement of groups of boys and girls in various subjects of the curriculum is necessary too. Such inquiries were recommended over fifty years ago by a Consultative Committee of the Board of Education.*

One of the people who in 1923 gave evidence to the Board was Cyril Burt who said:

> There are important physical differences (between boys and girls), there are also important differences in temperament and emotion; there are too, fairly broad differences due to training and tradition. But in the higher intellectual levels, at any rate before adolescence is completed, inherent sex differences seem undoubtedly small. The bearing of psychological conclusions upon sex differentiation in the curriculum is thus comparatively slight. Whether the training offered in Secondary Schools to girls should differ from that given to boys is a question to be decided on other than psychological considerations, by our views both as to the ideals to be aimed at in all education and to the parts which men or women should (or in practice will) play in a civilized community.†

Conclusions

Now fifty years later we have made the decisions. We have decided that it is essential to ensure that boys and girls and men and women have equal access to educational opportunities. No country can risk leaving any mind undeveloped. And the children of a mother who is educated in the broadest sense are less likely to perpetuate low standards in their children.

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* BOARD OF EDUCATION. *Differentiation of the curriculum for boys and girls respectively in secondary schools.* London, 1923 (HM Stationery Office).

† ibid, p. 90.

In our anxiety to be fair we need to recognize the plain fact that for most women home-making and bringing up children come first. For men the equivalent is to earn enough to support their wives and families. If there is conflict between job and family, for most women it is family first. In the kibbutz after two generations of rejection of traditional sex roles, most women have chosen to reassert their feminine roles. All this is essentially the evolutionary argument in real-life terms which recognizes that the different parts men and women play in society are complementary but equally valuable. 'Equal but different' is the evolutionary motto.

It is crucially important to recognize that, although there are average differences between men and women, *we ignore the uniqueness of the individual, man or woman, to our great loss.* Research effort needs to be stepped up which will help to pinpoint individual talent and provide teaching material to enhance it. Society will profit by attention to individual differences because there are obvious benefits to be gained from fitting the job to the individual instead of the individual to the job.

We need to be aware of the evidence which shows that the young, human mind which evolution has left extremely 'immature' and open needs to be nourished by a good language environment, opportunities for exploration and, for girls especially, spatial experiences. The importance of school and home is crucial to this.

Finally, it is very doubtful whether we shall be able to tamper in any meaningful way with our chromosome outfits, but we can adjust the environment to some extent—and this includes attitudes and upbringing—to maximize human potential in *each* sex. Perhaps the best agent for developing the character of one sex is the environment provided by the other, an environment best appreciated by the other and the result of long evolution and adaptation. In simpler terms, coeducation for most is natural. But there are individuals who prefer, and are fitted by temperament, to single-sex institutions, whether schools or college. To maximize individual potential, we need to match human variety with variety of provision.

The impact of science teaching projects on secondary education

Most pupils to whom science is taught in schools will not afterwards be in a position to 'do' science. Are they to be left in the hands of the 'doers'?

NORMAN BOOTH

Norman Booth is a Staff Inspector with special responsibility for science education

It is now seventeen years since the publication by the Association for Science Education (at that time the Science Masters Association and the Association of Women Science Teachers) of a policy statement *Science for All.* This started off what was to become an entirely new mode of science curriculum innovation in this country. Until that time there were three ways in which nation-wide changes were fostered. They were, first, through the agency of a popular text book; second, through the publications of the science teachers' associations; and, third, through the publications of the Department of Education and Science (then the Ministry of Education). The examination boards, exerting their influence on the grammar schools, took their cue by and large from the popular text books, assuming that they were representative of what was being taught.

A text book became popular because teachers found that they could use all or most of it with the pupils they were teaching—that is to say, it was readable, pitched at about the right level of difficulty, had clear diagrams, experiments that were clearly described and that worked, good descriptions of experimental methods beyond the scope of schools to provide, a nicely graded set of questions at the end of each chapter, some reference to industrial, medical, and other processes and to work of the great names of the subject, and a word or two about something new in the field.

The bulk of a text book consisted of well-tried material, arranged in a familiar order, but there were innovations. They came from various sources of which perhaps the most fruitful was the pioneering work of a small group of innovatory teachers who were either the text-book writers themselves or who contributed to *School Science Review* and displayed their work at the members' exhibition of the annual science teachers' associations meeting, at

teachers' courses, at branch meetings of the associations and elsewhere.

Following on the publication of *Science for All*, however, a new pattern emerged. Three groups of teachers set to work, by correspondence and with the occasional weekend and holiday-time meeting, to generate syllabuses in biology, chemistry, and physics. A fourth began work on a general preliminary secondary course. A physical science apparatus committee became active in the design of new experiments and secured the active cooperation of the apparatus suppliers, one in particular. One of the more significant innovations followed a conference at which doubts were raised about the feasibility of teaching aspects of modern physics by the preferred empirical approach. The heated, sometimes acrimonious, debate which followed was finally resolved by a proposal, made interestingly enough not by a scientist at all but by a civil-servant classicist, that teaching material—notes and equipment—for aspects of modern physics should be distributed to volunteer schools and that the feasibility of teaching it by what later came to be called 'the Nuffield approach' (then called 'the empirical approach') should be assessed by visiting teams representative of the physical science teachers' group and HMI. Two 'interim reports' of the physical science group, and largely new apparatus developed for the material of the reports, were accordingly distributed. The visits were made and a favourable conclusion reached. The concept of school trials had been born and were to become an integral part of all future curriculum innovation projects.

Nuffield and other projects

Heady with this preliminary success, ambitious plans were now laid to rework secondary science from beginning to end. But this needed time and money. There was no lack of eager workers. And so the Nuffield Science Teaching Project came into being, financed by the Nuffield Foundation and 'coordinated' by an appointee of the Foundation. There was much debate as to what projects should be started first: Sixth form or eleven to sixteen? Separate projects in biology, chemistry, physics? Or in physical science and biological science? Or just general science? Way back in pre-war days, the science teachers' associations had published schemes to meet the growing demand for general science, and, more recently, DES Pamphlet 38, *Science in Secondary Schools*, had argued cogently for an eleven to fifteen general science course for all. For several reasons—which include tradition, the dominance of grammar school thinking, the specialities of the teachers taking the lead, and (not least) sheer frustration at the lavish materials—books, apparatus, films—in production in the USA for high school physics, chemistry and biology—the decision was reached to produce eleven to sixteen projects, leading to examination at GCE Ordinary level, in physics, in chemistry and in biology. Work began

in 1962 and *Nuffield Biology* and *Nuffield Chemistry* were published in 1966, followed by *Nuffield Physics* in 1967. In a foreword to all three, the then Director of the Nuffield Foundation said: 'In all these programmes the principal aim is to develop materials that will help teachers to present science in a lively, exciting, and intelligible way'. It was realized from its outset that there would be three groups of teachers; those who 'did' Nuffield, and for them special O-level examinations were available; those who 'used' Nuffield; and those who saw no use for it with their pupils.

However, 'When the Nuffield O-level courses were first planned . . . it was not found possible to avoid the traditional division of school science into three subjects . . . But it was agreed that a combined course was most desirable, especially in the first two years—for children between the ages of 11 and 13'. The quotation is from the foreword to *Nuffield Combined Science* which was published in 1970. 'A common course for pupils of all ranges of ability during the first two (secondary) years.' There followed, in 1971, the *Nuffield Secondary Science Project*' . . . in response to a very specific need—the improvement of science in schools with particular reference to those children whose abilities make it unlikely that they will take science in the General Certificate of Education at O-level'. However, the foreword goes on to say 'The Organizer . . . , the team, and the Consultative Committee . . . have never regarded this starting point as a limitation or as implying that the less able need a different kind of science. They have thought rather that the best way of bringing about such an improvement was by the development of a source of materials taken from all the sciences . . . '. This left only the sixth form to deal with, and project teams were already at work to provide for them, so that 1970/71 saw the publication of three Nuffield Advanced Science Projects: *Biological Science* in 1970; and *Physics* and *Chemistry* in 1971. A fourth, *Physical Science* appeared early in 1973. The emphasis, as stated in the foreword to the biology and chemistry projects, is 'on learning rather than on being taught, on understanding rather than amassing information, on finding out rather than on being told'.

To complete this brief summary, three projects each coming into publication in 1974/5, and each sponsored and financed in whole or in part by the Schools Council, must be added. All three represent much greater breaks with tradition than anything to be found in the Nuffield materials. First there is the 'Science 5 to 13' Project sponsored jointly by the Schools Council, the Nuffield Foundation, and the Scottish Education Department. As its title implies, its later stages are for the eleven to thirteen age group, and as such it is in competition with the Nuffield Combined Science Project, from which it differs totally. The general preface says, 'It aims at helping teachers to help children . . . to learn science through first-hand experience using a variety of methods.

The Project produces books that comprise units dealing with subject areas in which children are likely to conduct investigations . . . The units are linked by objectives that the Project team hopes children will attain through their work'.

The second is the Schools Council Integrated Science Project, the sub-title of which is 'Patterns'. It is written for the thirteen-to-sixteen-year-old age range and leads to examination at O-level, and as such therefore is complementary to Nuffield Secondary Science and in competition with the three original O-level projects. Its content has much in common with the O-level projects, but it differs in having a considerable earth science section and in raising many of the problems of a technological society. Its approach is, in principle and to some extent in practice, as different as its sub-title implies.

The third is to be the Schools Council *Project Technology* which aims to encourage experience of science in action in the satisfaction of human needs.

There is then a great deal of material about. Taking it all together it represents a vast compendium of advice and information intended to make science comprehensible, interesting, and relevant to virtually the whole range of pupils. A project has already begun to work on science for those sixth formers whose target is not A-levels.

The impact on the schools

It must first be said that Projects do not represent all the new material that has appeared since the early sixties. Text books have continued to be written and most or all of them parallel to a greater or lesser extent the lines of the Projects. Similarly all GCE and CSE examination syllabuses, and the examinations themselves, have also shown parallel changes. Beyond doubt much of this is a consequence of the Project activities. Secondly, only *Combined Science* and *Science 5 to 13* in their very different ways fit the present-day organization of most maintained schools, i.e. the majority of all secondary schools with their comprehensive intake, mixed ability teaching, trends towards the 'individualization' of the learning process and so on. Given the old tripartite system from age eleven onwards, and sixth forms entirely geared to GCE Advanced level courses, teachers would have been presented with relatively few choices all reasonably clear-cut. As it is, teachers who do not find themselves in this position are faced with the prospect of compiling their own courses using the materials as sources, or of disregarding the organizational changes and doing one or other course, or, of course, of ignoring them altogether.

In an attempt to collect some information about the situation in schools, the science specialist members of H.M. Inspectorate obtained answers to a questionnaire from a sample of schools of all types covering the eleven-to-eighteen age range. There was

TABLE I: Science courses studied in secondary schools in England and Wales in 1973.

Results based upon answers to a questionnaire sent to 1,732 schools (boys, girls, mixed)*

Project	*Eligible schools*	*'Doing'*		*'Using'*	
		Number	*Percentage*	*Number*	*Percentage*
N. O-level Biol. First two years only	1600	89	5·6	136	8·5
N. O-level Chem. First two years only	1600	94	5·9	137	8·6
N. O-level. Phys. First two years only	1600	93	5·8	131	8·2
N. O-level Biol. All five years or years 3, 4 and 5	1669	161	9·7	567	34·0
N. O-level Chem. All five years or years 3, 4 and 5	1669	196	11·7	549	32·9
N. O-level Phys. All five years or years 3, 4 and 5	1669	203	13·0	563	33·7
N. Sec. Science (not including grammar and sixth form college, 1300)	1659	130	7·9	429	25·9
N. Combined Science	1639	500	30·5	381	23·2
N. A-level Biol.	836	88	10·5	178	21·3
N. A-level Chem.	836	159	19·1	217	26·2
N. A-level Phys.	836	112	13·8	121	14·5
N. A-level Phys. Sci. (one year)	836	–	–	3	0·4
N. A-level Phys. Sci. (two years)	836	14	1·7	7	0·8
SCISP 'Patterns'	1657	38	2·3	45	2·7
SC Project Technology	1669	21	1·3	118	7·1
SC Science 5-13	1639	9	0·5	97	5·9

* There were 170 nil returns (9·8 per cent)

virtually a 100 per cent response to a questionnaire that required only a few minutes for completion. Middle schools, grammar schools, sixth form colleges, and independent schools were included, as well as all types of comprehensive school; a nationwide coverage was obtained. The number of schools replying was 1,723.

The figures given in Table I represent the number of schools 'doing' or 'using' the listed material expressed as a percentage of the number of schools which could have chosen to do so. It is, for example, assumed that a school with pupils in the eleven-to-thirteen age range could be doing or using either the first two years of the separate Nuffield programmes, or Combined Science, or the later stages of Science 5 to 13. It is assumed that they would not consider, say, Nuffield Secondary Science as specific teaching material, even though the teachers themselves might well be benefiting from them.

The last five projects are so recent as to make the figures of no particular significance, but the rest do raise some interesting points. Except for Combined Science, there is throughout considerably more 'using' than 'doing'. No attempt was made to ascertain the extent of the 'using', so that it amounts to a statement by science teachers that they have found the project materials useful to a greater or lesser extent. Combined Science, as mentioned earlier, fits more than any other the preferred organization of the majority of schools and this is, perhaps, a major reason for its relative popularity. An important factor, however, may well be that one of the organizers of the project has himself conducted a series of substantial courses aimed at familiarizing teachers with the material.

The returns relating to the three O-level projects and Secondary Science indicate around three times as much 'using' as 'doing', although perhaps for different reasons. There is so much material in Secondary Science that it would be impossible to use it all, and it holds out the possibility of many courses compared with the other three, which are in effect sequential courses. Totals approaching 50 per cent for the three O-level courses can be regarded as highly satisfactory, and it does not, of course, mean that less than 50 per cent of English secondary schools have renewed their science curriculum since the mid-sixties. It only means that for one reason or another the style and content of these particular projects has not been seen to meet all needs and preferences, or that the necessary resources are not everywhere available for what are by their nature costly courses. The three A-level projects present an intriguing contrast. Chemistry has clearly taken the fancy of many teachers. Biology and physics not yet to the same extent, although there are indications that physics is gaining ground. There could be several reasons for this. The chemistry course probably contains less that is novel than either of the other two; over many years there have been many courses, conferences and symposia, particularly perhaps those organized by the Royal

Institute of Chemistry, which have prepared chemistry teachers for change. There has been less activity of this kind in biology and physics, even though the amount has been substantial. Chemistry teachers have felt the subject itself to be under greater pressure for justification of its place in the curriculum at pre-sixteen level than either biology or physics. University chemistry departments have seen a decline in applicants for places and, rightly or wrongly, they have associated this with unattractive sixth form teaching perhaps to a greater extent than physicists have and certainly more so than biologists, many of whom have appeared to be less concerned with sixth form biology than with mathematics and the physical sciences.

Matching changes

Schools have a free choice as to their science curriculum, although they do not lack advice and guidance and nor are they insulated from pressures to move in one direction or another. They are also free to change their organization and teaching style according to their view of the changing needs of their pupils and of the society of which they are members. The science projects considered here have been largely written to match the organization in vogue in the majority of schools at the time the projects were initiated. This is not so much so in the matter of teaching style where all of them have been written with an image in mind of the classroom or, usually, laboratory situation in which the material will be used.

There is considerable evidence that where a project, or part of a project, fits more or less nicely the organization of a school, there is a better chance of it being used, and of course this is not surprising. The figures for Combined Science seem to support this, as does the relative success of, say, physics O-level in the remaining grammar schools. Similarly, the closer a project is to meeting the felt needs of teachers, the more likely is it to be taken up, and certainly to be taught in the style the project writers had in mind when they wrote it.

It cannot be expected that the school will so organize itself as to match the way a project is organized, but where the preferred teaching style of the project is a proved advance on that in use by a teacher, much can be done by initial and in-service training. Although much is already done, there needs to be much more still.

A bigger problem of mis-match comes, however, when the project style bears little or no direct relation to a style which is seen by a growing number of teachers to be necessary for the needs of present-day schooling, for example individual or small-group learning.* Similarly this occurs where a course is a sequential

* It is interesting to note for example that the Scottish Integrated Science Project, which was not included in the survey, is becoming increasingly popular in the eleven-to-thirteen age range. To a large extent this is because it provides 'work-sheets' which can be used at once with mixed-ability groups.

one with a public examination at the end of it specifically designed to cover the course as such. If in the view of thinking teachers there are areas of content or style which are unsuitable for one reason or another (perhaps too difficult, perhaps too narrowly conceived and so on), then, as a course, it stands or falls in one piece.

All the projects subscribe heavily to the 'I understand when I do' theory of science education, and for most of the time this means I understand a generalization, and I add to my appreciation of a concept, when I have performed a chain of experiments (or done practical work, which is not necessarily the same thing), the results of which I can see to be accountable in terms of the generalization or concept. Applied throughout a science course this involves the teacher, who often has less than adequate assistance, in a heavy load of work preparing apparatus and equipment, and even more in supervising lessons. If, in addition, the teacher has to modify and adapt the project materials for the reasons mentioned earlier, it is not to be wondered at that many teachers need firm evidence that it really is worth all the effort.

The 'I do, I understand' principle applied overall inevitably involves the local authorities in heavy expenditure, and they too are not only entitled to ask, but must ask, for evidence that the gains justify the additional costs. Gains are, of course, short, medium and long term. This is not the place to discuss how we might set about collecting information in these three terms, only to say that it needs to be done. In the meantime we must remember that the great majority of the pupils to whom science is taught in school will not afterwards be in a position to 'do' science, and yet we need them to continue and expand their understanding of it throughout their lives. It seems highly likely that our understanding of the science 'done' by someone else depends on our being able to relate it, however distantly, with the science we have ourselves 'done'. For most of us making these relationships has to be taught, and time should be given to this in school courses. We must, in other words, *not* leave our pupils with the impression that 'I can only understand if I do—and if I cannot do I am totally in the hands of the doers'.

The extra year—one school's experience

How can schools make the best use of the RoSLA year? One way is to ease the transition from the classroom to 'the world of work'.

G A. FARLAM

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The vast increase in the numbers of fifteen- and sixteen-year-olds at school last year presented both a problem and an opportunity. The new and mostly reluctant fifth-year student had to be occupied in studies for an extra year, but the opportunity was there to make it a really worthwhile final year. Banbury School as the largest comprehensive school in the country could offer a wider range of study options than most schools, but by itself this wasn't sufficient. A wide range of study options does not always mean that a desirable and effective programme can be devised for the individual child.

Planning

The Upper School, a purpose-built building for the fifteen- to eighteen-year-old group was not big enough to cope with the over 500 strong fifth year expected in September 1973. This meant that 120 students could not be accommodated, so temporary classrooms were ordered for the extra numbers. Banbury School intended that the opportunity provided by the extra year should be fully exploited, and an investigation was started to find how this could best be done for the new fifth year student.

The academic student was already well catered for, so the investigation concentrated on vocational choice. All fourth year students were asked both what they would like to do and what they thought they ought to do in the fifth year. At the same time an analysis was made of the vocational courses that the fifteen-to-sixteen-year-old had chosen to follow in the past at the local technical college.

The main point brought out by the fourth year students was that if the extra year was to be worthwhile it had to be directly relevant to earning a living and should improve their chances of getting the job they wanted. It was also generally felt that mathematics and English were essential whatever else was studied. The list of vocational areas in which they wanted to study showed a very high agreement with the analysis of past choice. It was decided to make this pattern the basis for planning.

Banbury School and the North Oxfordshire Technical College already had very close ties and operated a range of linked courses that it was intended to extend with the raising of the school leaving age. It was now decided to take liaison one step further and to place the temporary buildings not at the upper school, but on the college campus a mile and a half away. Full-scale planning was started nearly a year in advance and a head-designate appointed, briefed with the task of providing individual programmes for 120 students.

The students in the school unit were to be full time at the unit, taking no lessons at the main school. The staff of four full-time teachers were to be responsible for CSE courses in the core subjects of English, mathematics, history and geography and each student was to spend about half the week on these subjects. The rest of the week was allocated to linked courses at the college for which its resources would be available and which its staff would teach.

After discussion with the college a number of options were planned so that the student could choose either one major or two minor options. Each option was designed so that it offered a complete course for the final year, and provided an introduction to the subject similar to the old pre-apprentice courses. It was clear that the college facilities would allow study in greater depth and with better resources than could be available at school. The initial offering was as follows:

Major options: each student taking all associated subjects.

Engineering—electrical engineering, automobile engineering, workshop practice, technical drawing, engineering science.

Construction—bricklaying, painting and decorating, carpentry, plumbing, technical drawing and science.

Minor options: each student taking two options.

Secretarial studies, art, fashion, dressmaking, cookery, catering, pre-nursing, pre-social service, agriculture and languages.

Selection

This provisional course structure was then put to the 500 or so possible students. It was stressed that all courses were equally open to boys and girls and that transfer to the unit would be voluntary. Initially 240 students showed a preference for the unit, mostly from the middle ability range. All fourth year students were then recounselled, those of very low as well as high ability in particular being advised to remain at the main school campus. This reduced numbers to about 180; the 120 who eventually joined the unit were selected at random, to give thirty each for the engineering and construction options and sixty for the minor options. Only one girl chose a major option, construction, while about 20 per cent of the boys chose the minor options.

With a total staff of only four, the students were split so that only half were on the unit premises at any one time, the other half attending their options at the college, or taking games and activities.

First year of operation

The temporary classrooms to make up the unit were in position a week before the start of term, but the equipment, although ordered a year previously, was not. The unit opened with total equipment of one TV set, one filing cabinet and fifteen art desks, but the college options started fully immediately, compensating somewhat for several weeks disruption within the unit.

The school children rapidly fitted in with the college students; they were made honorary members of the students' union, took their meals in the refectory and joined in all clubs and activities. They rapidly established themselves as an independent group, separating themselves from both the school and college yet retaining the advantages of both. During the year no one voluntarily returned to the main school.

Both school studies and options went well in the main, but there were problems. All school subjects were aimed at CSE but motivation was low, and this, combined with very mixed ability classes, made teaching difficult. The eventual CSE results were not bad, being directly comparable with those of their contemporaries who had remained at the main school. In the college subjects the two major options had few problems, following the well-proven pre-apprentice pattern. In other subjects the standard of student in both maturity and ability presented problems to the college lecturers, resulting in continuous replanning of courses. Many unexpected problems presented themselves, the girl doing construction proved excellent at painting, plumbing and carpentry, but found her hands too small to handle bricks, which meant that the college had to supply a load of small bricks.

Finally, in order to make this final year match the needs of the individual, a work-experience programme was integrated into the curriculum. All students were released to work in periods of a week, joining a firm and working as far as possible a normal working week. Each placement was carefully selected, sometimes to confirm or decide a career choice, or sometimes with the intention of changing a misconception. In general, the programme was highly successful, with some 200 placings, many resulting in offers of apprenticeships or jobs on leaving school.

In the college atmosphere the children matured rapidly into students. Very real antagonism to the final year at school changed grudgingly to admitting that it wasn't too bad. A visiting HMI, choosing six children at random, gained the surprising but unvarying response that they thought the extra year worthwhile and better than going to work at fifteen. In particular, those gaining Royal Society of Arts and Pitmans typing, City and Guilds

153 Catering and similar exams felt they had done as well as their more academic contemporaries with their O-levels.

When the students were first interviewed, most of them who were able to do so said that they would leave at Easter. In practice only 20 per cent of them did so; the rest remained at school to take their exams and complete the course. After the CSE exams, attendance remained at well over 90 per cent, largely because a very intensive work experience programme had been arranged. Vandalism and hooliganism were not eliminated but were minimal throughout the whole year.

Initially only two of the intake had the intention of carrying on as full-time college students but a check during the penultimate term showed that 60 per cent intended continuing in some sort of further education. In practice 15 per cent have become full-time students and those known to be taking day release or part-time courses bring the figure up to about 60 per cent; this agrees with prediction and is well above anything that might have been expected from the group.

Second year

The lessons of the first year showed that the basic operations of the unit fitted the needs of the group it served. The options offered by the colleges were adjusted in the second year with agriculture becoming a major option, pre-nursing and pre-social service being combined into a more general 'all about people' course. Fashion and dress were combined and two new minor options were offered —librarianship and hairdressing. A limited amount of work experience is combined with catering and hairdressing options within the curriculum, in addition to the continuation of the previous scheme.

Extensive counselling by year tutors and class teachers was carried out throughout the fourth year and resulted in the applications for places being met exactly. One unfortunate result of this was that girls who showed interest in engineering and construction were dissuaded at an early stage, and there were eventually no girl candidates for either option.

The group again are of middle to low academic ability and have formed themselves into a similar group to that of last year —integrated but identifiable. Truancy and absenteeism seem confined to those with a past history of such behaviour, and at present vandalism and hooliganism is at a low level. Antagonism to the extra year is still strong and is more specific than last year. Work experience has only just started and this may cancel out some of the antagonism.

Conclusion

The unit may justifiably declare itself reasonably successful. The students enjoy and benefit from the courses offered. The size of the unit allows individual attention to be given to all students,

and the curriculum is arranged to give great flexibility in matching individual needs. The students last year considered the work experience programme the best element of the course, but it is also the most demanding on staff time.

The unit was planned with a limited life but experience has shown that marginal students can be motivated during, and even converted to favour, the extra year at school.

Trends 1975/1

Curriculum organization in a further education college

This article describes curriculum and organizational changes carried out during a three-year period at a college of futher education.

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East Devon College of Further Education is situated at Tiverton and has some 450 full-time, 1,000 part-time day, 800 evening students, and an area responsibility for 4,500 adult education enrolments. The area is mainly agricultural with a number of medium-sized manufacturing towns.

By 1970 the college had developed in a fairly traditional way, serving the interests and needs of the area, with an emphasis on the training of craftsmen and technicians in engineering—motor vehicle, agricultural engineering, and construction. There were developing courses in business and secretarial studies and a number of students pursuing GCE O- and A-level courses. There were three major departments: Engineering, Business Studies, and Adult Education, structured on traditional technical college lines under the direction of heads of departments. A department of Academic and Social Studies was established in 1972.

The aims of the college at that time were expressed simply as being: to provide courses of further education which would prepare students for specific examinations, linked with their career aspirations and employment; and to continue the broad education of these young people so that they become worthwhile men and women and responsible citizens. These aims were largely achieved through a fairly autonomous departmental system based upon structured courses which, apart from the strictly GCE courses, had varying degrees of vocational content.

Full-time courses, e.g. secretarial, pre-nursing, pre-professional business studies, technology, engineering, science, technician, and similar courses, were structured and pre-determined and, although they were eminently suitable for a number of students, they tended to limit the choice of others whose needs they did not fully meet. When an opportunity occurred to examine this situation, a new aim began to emerge—that of providing personal education for individuals. To meet this additional aim, and to make the best possible use of available resources, student programmes would need to be college-orientated rather than departmental. If it were possible to devise a system in which a student selected his course programme from the total resources of the college, the available options would be effectively increased and students would be able to construct more meaningful and personal timetables compatible with their interests, needs, abilities, and aspirations. The full-time student body was not large, and therefore such considerations were capable of controlled development and evaluation. A number of other factors supported these considerations:

1. An increasing number of students required study programmes which did not fit into the normal pattern. They neither wished to follow a traditional sixth-form course nor a vocational course, and were seeking courses with a greater element of general education than the structured courses would allow. At the same time, they desired to have a commitment to a reduced but more selective range of vocational/professional studies.
2. Many of the structured courses were over-specialized, and others included material and studies which few students would ever use. There was a need to preserve the best features of these courses and to introduce greater flexibility of choice outside the essential professional core subjects.
3. A number of students in one area of work desired to have some contact with the knowledge and skills of another department as part of their minority studies, e.g. students in the arts and academic fields wished to undertake some vocational experience as a personal skill.
4. Not all students were capable of pursuing a range of studies at the same level. Variation in individual abilities and attainment seldom could be satisfactorily met within the usual pattern of courses.
5. Some of the advantages of belonging to a comprehensive college society were reduced by departmental organization. There was a need for students to identify with the college as a whole and to develop a sensitivity towards young people in other occupations. If they could share some of their educational experiences, they would have distinctive contributions to make and would acquire knowledge and understanding of the requirements and nature of other disciplines,

approaches and work situations, and would be in a better position to appreciate the associated problems and related human responses.

6. There was a need to preserve options, particularly for:
   (a) students who had experienced poorer examination results at school than they had expected who wished to make good part or all of this before becoming fully committed to a vocational/professional course or some other form of further or higher education. There was a need to establish programmes with mixed examination aims both in disciplines and levels of attainment;
   (b) students who had made limited but steady progress during their secondary school career and whose academic attainment was still capable of further development. These students could greatly enhance their level of achievement and job possibility by a continuation of their general education, particularly if associated with units of vocational experience and knowledge;
   (c) students following traditional sixth-form programmes who should be given opportunities of acquiring some skill, e.g. typewriting; in the electrical, electronic and computer fields; in electrical or mechanical engineering; or specialist knowledge and practice, in the para-medical and nursing fields or accountancy, for example. If, later, these students were unable or unwilling to continue to higher education, or preferred to delay the start of such courses until they had obtained some experience of the outside world, they would have specialisms which could be interpreted in terms of job opportunities.

A modular grid

To meet the changing demands of students and to enable the greatest possible flexibility and choice, a unified system of timetabling for the whole college was introduced in September 1971. Full-time and a limited number of part-time students were able to select individual programmes from the college modular grid which contained the complete range of options available to full-time students, and was arranged into twelve modules consisting of 5 × 6-hour and 7 × 4-hour units. These were so planned that combinations of 4- and 6-hour modules were usually accomplished without any gaps in the individual programmes. Within each module there were up to thirty subject choices at varying levels, and altogether there were nearly 200 options. The modular grid included thirty GCE O- and twenty-six GCE A-level subjects, Ordinary National Diploma courses, vocational and professional studies, units of part-time courses, recreational and liberal studies programmes, tutorials, and opportunities for project work and direct work experience. In short, it presented the full range of educational opportunity available within the college.

When the modular grid was devised, criteria had to be established for determining individual student programmes. The aim was to achieve tailor-made programmes which would take into account individual interests and needs compatible with ability, attainment and higher education or professional/vocational aspirations. Each programme had not only to be meaningful but also to be a complete and broad educational experience. It was felt necessary to encourage a multi-disciplinary approach within a fairly flexible framework of guided choice. A great deal of responsibility rested with the heads of departments and the tutor advisers who had the task of guiding student choice so that sensible and balanced programmes could be established. College admission tests were introduced, interview procedures were revised and head-teacher confidential report forms were redrafted so that the fullest possible information was available on which realistic decisions could be taken.

A full programme consisted from five to seven modules made up as follows:

Major studies	— 3 to 5 modules
Supporting studies	— 1 to 2 modules
Minority studies (elective and liberal studies).	— 1 module

The major studies could include up to three GCE A- or five GCE O-level subjects, a mixture of both, or combinations of academic and vocational studies at varying levels. Similarly they could include the essential professional core studies of the vocational course which seldom absorb more than four modules.

Complementary and contrasting studies

Complementary and contrasting studies are supporting modules chosen to give breadth to the major studies or to add further dimensions in other disciplinary areas. Integrated schemes linking a number of subjects were introduced and were of value in attempting to break down subject barriers and isolation. The arts module brought together developments in music, art and drama and was of interest not only to students following major studies in these subjects, but also to students from other disciplines. The college organization made it possible for A-level psychology and sociology students considering future careers in the social services to attend parts of the day-release study and training courses for experienced social workers. The full-time students did not attend the case study sessions but they learned a great deal of the responsibilities and range of work of the profession from practising social workers whose lectures they attended.

The drama workshop which concentrated on communication skills and personal development attracted sixty students from all departments and was particularly popular and successful with

secretarial students. The workshop processes option attracted a number of child care students who acquired some elementary skills which enabled them to construct toys and furniture for play-groups. Students following typing as a major study were joined by other students seeking a personal skill. Similarly, students from farming communities following general education programmes joined agricultural engineering and maintenance course units designed for day-release agricultural mechanics.

Opportunities for project work and direct work experience were built into the supporting modules. Students were encouraged to undertake research of their own choice as much removed from the lecture room as possible, either individually or in very small groups. They largely worked on their own initiative within the framework agreed with the tutors. Some projects had relevance to future careers, e.g. 'The Writing and Illustrating of Children's Stories'; 'Children at School'. Others were associated with historical, sociological and other general interests, e.g. 'Tiverton in 1873'; 'People at Work'; a cine film of the rehearsals and performance of a college oratorio.

Attempts were made to extend the work experience periods usually associated with the more specialized courses, e.g. Ordinary National Diploma in engineering and business studies, and medical secretaries course to modular-based courses. Pre-nursing students spent two half-days each week working in local hospitals and homes for the elderly. Students interested in child care assisted in day nurseries and playgroups, and intending primary school teachers visited and worked in the local schools. Secretarial students undertook typing and duplicating assignments for the primary schools and also updated the Dewey card system of one of their libraries.

The flexible modular organization can be illustrated by the following two examples:

1. A student who is a farmer's daughter and was keen to follow the family tradition studied A-level biology and O-level physics in order to complete her qualifications for possible entry to a college of agriculture. During the week she also joined the day-release course in animal and crop husbandry and farm machinery with young workers employed in industry. In addition, she chose to study accounts, which she regarded as important in present-day farming. Under normal circumstances such an individual programme spanning various departments would have been impossible.
2. A mature student, who had been at work for several years and now wished to be a social worker, followed a major programme of GCE subjects to secure entry for training. He was able to join day-release courses in social work provided for professional staff already at work in this field. His two supporting or complementary modules were used to do voluntary work in an old people's home and to com-

plete a film project on 'Life from a Wheel-Chair'. The college modular system had enabled him to build a programme around his career needs and interests.

Minority studies

All full-time students follow a module consisting of two hours liberal studies, and two hours elective studies. In September 1973 a two-hour tutorial period was also added to this module. The main concern of the liberal studies programme is to give further dimension and balance to student programmes and to promote clear thinking and greater self-expression. Team-teaching methods or coordinated schemes around a common theme are followed. Staff and students from all disciplines are drawn together, and importance is placed upon the composition of groups so that students have the opportunity of working with others with whom they normally have little contact. Similarly, each team of staff working with any major group of students is composed of lecturers with a range of specialisms and interests, and usually includes at least one scientist or technologist, one creative artist, and one historian or social scientist. The staff themselves gain greatly from the experience of working with other specialists on a common programme in which their contributions and ideas may not be in agreement. Student involvement and constructive criticism are encouraged by their contrasting backgrounds, and responses are further stimulated by the breadth and diversity of the approach.

The elective studies programme provides a choice each term from over twenty activities and has recently included the rehearsal and public performance of two original rock oratorios written by the English and music staff. Whilst there are a number of group activities and team games, emphasis is placed upon individual recreational and cultural activities which can be enjoyed without dependence upon the availability of other people, e.g. shooting, fly fishing, canoeing, sailing, riding, swimming, yoga, painting, and the playing of musical instruments.

Students are assigned to a personal tutor who is responsible for the general welfare and progress of a group of from ten to fifteen students. The tutor has a major teaching commitment within the students' main areas of study and would have also played an important role in devising their individual programmes. To overcome any problems associated with dispersal through the module system and to strengthen the counselling services generally, a two-hour tutorial unit has now been included. The first hour is devoted to a programme of 'Education for Citizenship', dealing with responsibilities, careers, running a home, parenthood and personal development. A number of syllabus banks and packages have been produced for use by all tutors. The second hour is used for individual and group situations in which personal contact with the students is developed.

Organizational development

In the first year of operation the majority of students selected fairly traditional programmes despite the wide range of options afforded by the modular grid. It became clear that students and staff did not fully understand the possibilities presented by the new system and so in-service training sessions were arranged so that the interrelationship of the new structure and the changing philosophy of the college could be further explained and discussed. The monitoring of student programmes initially presented some problems and additional administrative work. There were staff who feared that dispersal through the modular system would result in a general lack of group cohesion and individual motivation. These fears have not been substantiated either in terms of personal motivation or achievement. Certainly the individual programmes, particularly in the last two years, have constituted more ambitious and relevant educational experiences (outside any examination imposition). Moreover, the examination results of modular-based students in June 1972 and 1973 showed improvements over the structured courses of previous years. In English, where setting had been incorporated for 160 students, the examination results were substantially better, and the system has been extended to other subjects. It is clear that, where programmes of study are built on individual strengths, needs and interests incorporating various levels of study, effective personal motivation takes place. However, greater responsibility falls upon the personal tutor, and the strengthening of the tutoral system was felt by many to be necessary. At the same time it became possible to appoint a professional counsellor and to restructure the whole counselling system.

The operation of the unified timetable with its opportunity for multidisciplinary study gave the opportunity of re-examining the college's academic structure. A discussion document was drafted and discussed at length by the whole of the staff. It was eventually agreed that a matrix structure of organization would be more appropriate to the college pattern of timetabling, and this was introduced in September 1972. The scheme was primarily designed to stress the importance of curriculum development and teacher participation, and to separate the administrative function from the academic, leaving heads of departments to continue to organize, administer and develop courses and be responsible for general discipline and progress. Lecturing staff were organized into thirteen academic teams and given greater academic freedom and responsibilities for the development of their disciplines throughout the college. Heads of studies were appointed to give the necessary academic leadership and coordination and each team became a sub-committee of the academic board. To encourage integrated studies, senior lecturers responsible for curriculum development were appointed to identify areas of cooperation and coordination between the academic teams.

Conclusion

The new approaches, with their concern for individual students and curricula, have proved to be appropriate to the continued development of the college in meeting the expressed needs, particularly of full-time students, in the sixteen-to-nineteen age group. It is clear that organization is more important than size in determining breadth of opportunity—it could well be that size in itself inhibits choice because of resultant organizational problems. Our experience has shown that new patterns of curriculum development can be evolved in a further education institution where the full-time equivalent student numbers range from 650 to 850.

Trends 1975/1

A new approach to teacher education

How can we develop in student teachers the skills, abilities and values they will need as soon as they take up their first appointment?

J. M. CARNIE and M. PRESTON

Dr. Carnie is Deputy Principal of the Charlotte Mason College of Education, and Dr. Preston is Director of Studies

Current changes are obliging virtually all colleges of education to reconsider the kinds of higher education experience they offer to students intending to teach. In the last few years the colleges have been subjected to a number of strong and often valid criticisms. Frequently courses have appeared fragmented and have failed to give students the sound basis of skill and knowledge needed in a first teaching appointment. College tutors would themselves not always wish to defend their courses, but would point to a variety of factors which make their task difficult.

Students usually arrive in college after some twelve years of schooling, spend their three or four higher education years in a school-orientated setting, and immediately on certification or graduation take up posts as teachers in schools. The college tutor's role is a daunting one; to convert these young people from pupil to teacher in a hundred or so weeks. The centre of concern, the classroom, is one in which experienced teachers frequently fail

to be effective, defeated by the complexity of interaction in which one adult is expected to meet the individual needs of thirty or forty children, ranging from the willing to the reluctant learner and from the gifted to the almost ESN. The tutor knows that after providing initial training students with some classroom understanding and skills the adjustments and learning demanded in first posts will be tantamount to re-training, in which most of what has been previously learned will be forgotten or rejected.

The possibility of change

These are factors in the teacher training scene which are going to alter little. There are, however, other limiting features which are more open to change, though the tendency has been to regard them too as facts of life. In particular, the assumptions that a college student's personal education will suffer if he does not take courses in purely academic subjects, and that the theory of education can usefully be studied apart from its practice, are open to challenge. The untested hypothesis has been that it is essential in preparing students to teach at any age level that their minds should be as well-furnished as possible with knowledge and understanding of one or more subject disciplines; without this their personal education would be neglected, and without this . . . how would they know what children need to learn?

A good half of students' time and energy in colleges has traditionally been devoted to such academic pursuits. University pressures to achieve Honours degree standards have recently pushed staff and students to still more academic effort in both subject and educational studies. As a result, in that half of the course which is supposed to relate to the classroom the gap between educational theory and practice has grown, and students have increasingly found too little inspiration and helpful guidance in their Education and Method courses. The latter especially have remained relatively undeveloped areas of the colleges curriculum in a period when the teacher's job in the classroom has grown greatly in complexity. Rising national expectations of the process of education, massive innovation, and increased consumer resistance on the part of many pupils have all increased the difficulties of the teacher. College staff, albeit for reasons which are in large measure beyond their control, have been looking too much towards the universities and the demands of higher education, and too little towards schools and the requirements of primary and secondary education.

When concerned with the needs of students preparing to teach in first and middle schools—that is, more as generalists than as specialists—college tutors have failed to take account of two very considerable changes in post-war educational experience in this country. First, what goes on in schools is now far more complicated than it was ten or twenty years ago, and therefore far more needs to be known—and, indeed, far more is there to be learned

—about classroom processes. Second, improved schooling has led to greater intellectual demands being made on pupils, especially in their sixth forms, with the result that students enter college at a higher intellectual level than in the past.

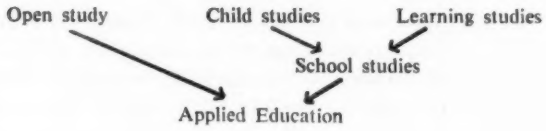
There is no lack now of theory directly relevant to classroom practice. For example, the importance of understanding the conceptual growth of children in various fields is well established, as is the need to provide a wide variety of appropriate learning experiences to improve opportunities for learning, and the significant effects of teacher expectations on pupil performance in these situations is currently being revealed. Students cannot acquire insight and skill in such matters if the approach is piecemeal; they need well-structured courses related to professional needs and the opportunity for concentration.

A new approach

Dissatisfaction with various aspects of teacher training in this country led to the James Committee's enquiry, and the observation in its report of 1972 that 'Criticisms of the present system, which we hold to be justified, point to the need for a radical solution'. The subsequent White Paper *Education; a Framework for Expansion* set as the aim for teacher training: 'the progressive achievement of an all-graduate profession by means of a more flexible, open-ended and challenging pattern of courses'. Subsequently, many colleges have been examining their approaches to teacher training—among them Charlotte Mason College at Ambleside, where a radical reappraisal resulted in completely new BEd courses in Applied Education (Ordinary and Honours) being accepted in detail by the Senate of Lancaster University.

The Applied Education ordinary degree course will be central in the college's new curriculum. Its aim is to satisfy both the standards of a pass degree and of a professional teaching qualification by developing in students the skills, abilities and values required of a teacher taking up a first appointment. The course is essentially for non-specialist teachers of children from three to thirteen. In it the customary distinction between academic subjects and the study of education is ended, and the centre of the student's attention is less on subject content than in the past and more on the nature of knowledge, the child's conceptual growth, and methods of learning and teaching in a variety of fields. In fact, the programme of work is based on the belief that if the student is encouraged to focus his attention on how children learn and on how teachers can provide effective learning situations for them, there will be in this central aspect, and in all the related areas, more than sufficient course content to provide interest and satisfaction for the intending teacher. Indeed it is expected that he will both be better prepared than in the past for his first teaching post and will have received, through his concentrated study of a vital area of human behaviour, a worthwhile personal education.

The whole of the staffing resources devoted to the initial teacher training sector of the college's work is being redeployed, and all traditional college departments, including education, will vanish. In their place, under a Director of Studies, teams of tutors will offer courses in child studies and learning studies, and all members of staff will join school studies teams and will act individually as tutors for open study. The relationship between core programmes in the new Applied Education degree course can be seen as:



The courses

The school studies course will provide the integrating element in the new programme. Teams of tutors and students will work together for one day a week through the first two years. Building on arrangements which have been developed with local schools in the last few years, they will regularly visit the 'home schools' assigned to their group, observing children and investigating their educational needs. As each part of an appropriate sequence of learning problems is reached, the team will prepare related programmes of work for the pupils, will try these out in school, and subsequently evaluate the results. Again, building on present practice, the class teachers will be encouraged to join in as members of the teams, and the barriers between school and college, already lowered in the locality, will further diminish.

The syllabus for this part of the degree programme specifies various aspects of classroom organization and the school curriculum which must receive attention. Links are also formed between school studies and the students' work in the child and learning studies courses. Two compulsory one-year courses are to be taken in art media and resources for learning. By a progression of work in college and in school, the student will be prepared for two periods of individual teaching practice. The second and longer of these will extend through a whole term in the third year. It will be preceded by a lengthy period of guided preparation and followed by the writing of a long report evaluating the practice; this will be an assessed part of the degree course.

As the students' practical understanding of the child grows through work in schools, they will find support in more theoretical terms from the child studies courses. Language and reading development will be a compulsory course for at least a year, depending on the age level the students intend to teach. The optional courses, including early childhood, individual differences, and education and society, are designed to provide knowledge and

understanding of the development of the child and of environmental influences on his learning experiences. They can be followed for one, two, or three years.

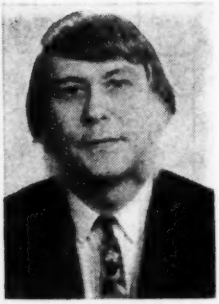
The learning studies courses are intended to help the student understand the structure of knowledge in a number of fields important to children in first and middle schools. The focus will be on key concepts, on the stages and nature of conceptual development, and on the provision of effective learning experiences. Mathematical education will be a compulsory course for all students for one year; three other two-year courses must be chosen from such options as creative arts, moral and religious education, social studies, and science education. It is these courses which are most radically different from those of previous college programmes. Developed from the DES experimental teacher training project, now in its fourth year at the college, they are applied in the sense that they will be primarily concerned not with the students' knowledge of a field for its own sake but with the understanding gained of the nature of the field and the processes of learning within it.

While it is expected that the personal education of the students will have been more than adequately sustained by the range of purposeful study and activity outlined above, each student will also have, in open study, the opportunity to develop a personal intellectual interest during the first two years of his course. This will be in an area which does not overlap with his required studies. It will be tutorially guided, and will be assessed as part of the degree course.

A programme of teacher training as innovative as this could only be developed and accepted as the result of extended staff consultation and planning. Now that this programme and the related DipHE and Honours degree programmes have been accepted by Lancaster University, and the college staff have been reassigned to their new course responsibilities, bridging courses are being worked out to link the existing courses to the new ones commencing in September 1975. A staff development programme is also under way in order that, as a group and individually, members of staff can prepare themselves for their new roles in the college. Radical solutions of the kind called for by the James Committee will be more taxing for both staff and students engaged in teacher training but in all probability more rewarding.

More about microteaching

Microteaching is designed 'to develop new teaching skills and refine old ones'. Does it work?



GEORGE BROWN and SHEILA ARMSTRONG

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Microteaching may be described as a scaled-down version of real teaching, designed to develop new teaching skills and refine old ones. In a typical microteaching programme, a student or teacher usually teaches a small group of pupils for a period of from five to twenty minutes, observes his lesson on videotape, and perhaps reteaches it to a different group of pupils. Most programmes are based on the component skills of teaching—questioning, explaining, encouraging pupils to participate, gaining and holding attention, and so on. The students sees a demonstration of skill either by the tutor in charge or on videorecordings and is then given the opportunity to practice it. Most microteaching programmes conclude with global practice of teaching to weld together the individual skills.

Microteaching was begun at Stanford University, California, by Dwight Allen and his team of teachers and researchers. Their programme was based upon narrowly defined skills and very brief (three-to-five-minute) episodes of microteaching. We tried their methods for one term at the New University of Ulster but found them inappropriate. Our student teachers had great difficulty in concentrating on one skill for such a short time and found the reteach sessions depressing. The programme was extremely difficult to organize and students never saw one another teach. This first attempt perhaps prompted Brendan Spelman and Caroline St. John Brookes to write an article for this journal (TRENDS 31, July 1973) expressing their reservations about the use of microteaching in the training of teachers. They rightly pointed out, in a list which could readily be extended, some of the weaknesses of the Stanford approach and the apparent naïveté of the underlying behaviourist assumptions. It is not our concern in this article to support or question their views. Instead we propose to describe

Figure 1. A model for the discussion of teacher training

the rationale underlying the microteaching programme at Ulster, to outline the programme, and report some of the research we have carried out which indicates that microteaching is an effective method of learning to teach.

The basis of microteaching at Ulster

At Ulster we were not only faced with the problem of teaching 'teaching' to relatively large numbers of students taking courses in every school of the university but were situated in a rural area with too few schools to support a conventional teaching practice programme. Necessity is the mother of invention. We adopted a radical approach based on observation and analysis of teaching in schools in the first year of the course, small-group teaching with videotape feedback in year two, and school experience in year three. A fully fledged teaching studies programme was gradually developed in which studies of teaching are closely integrated with training in the skills of teaching.

The model underlying our approach is derived from the work of philosophers such as Othaniel Smith, Israel Scheffler and Paul Hirst, and from the social skills model of Michael Argyle.

Teaching is an intentional activity, the general intention being that pupils will learn. The intention needs to be specified more clearly in terms of goals and objectives for the teacher and learners. The intentions are translated into actions via what are called the 'central processes' of the teacher. These are his personality characteristics, his language skills, attitudes, values, and style of thinking. It is these which make every teacher's style of teaching unique, and this has erroneously led some people to conclude that therefore you cannot train teachers to teach. Teaching, it is maintained, is a function of personality and an art. Flying aircraft and performing surgical operations are also idiosyncratic arts. Fortunately neither pilots nor surgeons learn only through their own experiences, but are given ground rules which they learn to modify as necessary. We adopt a similar approach in the teaching skills programme in year two. Rules of planning and performance are given in activities, lectures, and demonstrations. The students have opportunities to practice the skills involved and to observe and discuss their videotaped lessons.

Teaching, however, is a two-way process and merely giving rules is not sufficient. The actions of the teacher produce changes in the pupils, which in their turn may produce changes in the teacher. To further complicate matters the pupils' intentions may be different from the teacher's and the pupils may take actions designed to produce changes in the teacher. Teaching in this light becomes a series of negotiations.

It follows from this that one needs to train teachers to observe their pupils so that they detect signs of boredom, frustration, interest, and enthusiasm as well as the more obvious signals of correct answers to questions and relevant contributions. Pupils

Figure 2. An expanded model of teaching

intentionally and unintentionally give this feedback but the feedback and its meaning can go unnoticed unless a teacher has been trained in what to look for. Hence we also emphasize ground rules of perception in our training programme.

Planning, performance, and perception are therefore the three main constituents of teaching. An experienced teacher carries out these activities apparently effortlessly most of the time for he has developed and internalized his ground rules. He knows how to plan, how to get pupils to learn, and what to look for in his pupils' behaviour. A student teacher has to not only get his pupils to learn, as the teacher does, he has also to learn how to teach.

The question then arises 'How can a student be best taught how to teach?' Should he be given a class of forty children and left largely to his own efforts with occasional prompts from the class teacher and ever rarer prompts from his supervisor? Or should he be gradually introduced to the complexities of teaching in a situation where he can actually see and analyse his own performance and that of his pupils? At Ulster we plumped for the latter and developed a teaching skills programme.

The Ulster teaching skills programme

Towards the end of the first year, students form themselves into groups of six for peer group teaching. All the teams receive an introduction to microteaching and basic guidance in the planning of lessons. Each team member in turn teaches a simple five-minute lesson to four of his peers in a microteaching laboratory and the fifth operates the cameras and videotape recorder from a control room. The members of the team then go to a nearby viewing room where they watch and comment upon their own and each other's lessons. Three weekly sessions are devoted to peer group teaching. This part of the course provides an opportunity for the students to operate the equipment, to iron out most of their nervous gestures, and to come to terms with seeing themselves as others see them. This is an important learning experience, for the presentation of self is central to teaching. At this stage no supervisors are present so that the students do not feel they are being evaluated.

At the beginning of the second year the students form teams of four and are assigned to a class of twelve pupils for weekly sessions of microteaching. These are held throughout the first two terms with nine-to ten-year-old pupils brought to the University from local schools. Each week the students plan and teach a fifteen-minute lesson which they observe and discuss with their supervisor and other members of their team. The supervisor's role is to help students to improve their own analyses and understanding of teaching rather than rigidly impose his own views. The supervisor is asked to use the 'listen and tell' approach, by asking the student his opinion of his lesson and inviting comments from other members of the team before summarizing and making suggestions.

Each week the students carry out a specific task in their teaching and viewing. In week three of the course, for example, students attend a lecture and demonstration of the skills of 'set' and 'closure'—which are ways of introducing and ending lesson topics. Their task is to plan a lesson, paying particular attention to the manner in which they introduce and round off the topic, to teach the lesson, concentrating again on the beginning and ending, and

Figure 3. The Ulster Teaching Skill Programme 1974

BASIC PLANNING	1. Introduction to microteaching	How the equipment is operated
	2. Lesson planning	Peer group teaching
	3. Lesson planning	Peer group teaching
BASIC TRAINING	4. Observing teaching	Peer group teaching
	5. Observing microteaching	Pupil teaching
EXPOSITION	6. Teaching concepts	Pupil teaching
	7. Set and closure	Pupil teaching
	8. Teacher liveliness (enthusiasm)	Pupil teaching
	9. Explanation	Pupil teaching
	10. Exposition (skills 6-9): an overview	Pupil teaching
QUESTIONING	11. Asking questions	Pupil teaching
	12. Asking higher order questions	Pupil teaching
	13. Improving pupils' answers	Pupil teaching
	14. Listening and summarizing	Pupil teaching
DISCUSSION	15. Observing pupils	Pupil teaching
	16. Reinforcement (controlling and encouraging)	Pupil teaching
	17. Gaining pupil participation	Pupil teaching
	18. Discussion (skills 11-17): an overview	Pupil teaching
RECENT RESEARCH	19. Research on teaching and microteaching	Pupil teaching
	20. Research on teaching and microteaching	Pupil teaching
	21. Research on teaching and microteaching	Pupil teaching
	22. Discussion of course	Pupil teaching

Notes
1. Student plan, teach and view their lessons in teams.
2. Planning and perception continues throughout the course.
3. Specific activities are set each week for teaching and viewing.
4. In the last four weeks, students must plan and teach a course of four linked lessons. Prior to this, lessons need not be linked —although most students choose to do so.

finally to analyse this aspect of their teaching. In the viewing sessions, rating schedules and checklists help the students and supervisor to focus upon the skills under review.

The performance skills which the students practice are split into three clusters—exposition, questioning and answering, and discussion. The specific skills involved can be seen in the course outline (figure 3). In the final section of the teaching skills course the students are asked to plan and teach a series of linked lessons using any combination of methods they choose. The course ends with a series of lectures which review recent research on teaching and microteaching. In the final session the students are invited to discuss their microteaching experience and to suggest changes in the programme. A similar course evaluation session is organized for supervisors.

The microteaching laboratories are carpeted to reduce unnecessary noise. They are equipped with lightweight classroom furniture, a display board, an overhead projector, and a blackboard. Stores of curriculum materials and mobile science laboratory benches are near at hand. There are four microphones suspended from the ceiling and two fixed cameras with wide-angle lenses which transmit the pictures of the pupils and teacher to the laboratory's control room. The control room contains three TV monitors and a mixer.

The student operator can record either the teacher standing at the front of the class, the pupils, or both. The viewing room contains a monitor and a videotape recorder. The cost of TV equipment for a microteaching laboratory with a control and viewing room is in the range of from £1500 to £2500. The saving in travel and other expenses (estimated to be about £3·50 per student per week) could pay for a laboratory while at the same time reducing the pressure upon school placements and giving the supervisors more opportunity to see their students teach.

Some research findings at Ulster

The obvious question to ask of microteaching is 'Does it work?' The short answer is a qualified yes. Significant changes in teaching performance throughout microteaching were found in two groups of students ($n=50$, $n=20$). We measured the changes in two ways: first, by comparing supervisor, student and independent observer ratings of different teaching skills in the first and last microteaching session—at this time, the students did not have any peer group teaching in year one—and, second, by analysing the interaction of student teachers and pupils using Flander's category system. The interaction analysis results showed that by the end of the programme students asked fewer questions but obtained more pupil answers, they used and elaborated upon the pupils' contributions more and obtained more voluntary contributions, they used silence more effectively, were less hesitant in their explanations, and they talked less.

We have also followed up the performance of the students in schools in two successive years. In both cases the correlation between the student's performance in his last two sessions of microteaching and the last two weeks of school experience a year later was highly significant (at the 1 per cent level). For this investigation we used supervisors' ratings on the same checklist of skills (known as the lesson appraisal guide) in both microteaching and school experience. The supervisors had different students for microteaching and school experience and did not know the microteaching ratings of the students they were supervising in schools. Interestingly enough, the class teachers' ratings of the students' performance in schools also correlated highly significantly (at the 1 per cent level) with the ratings received by students in microteaching.

It seems then that students rated high (or low) during microteaching are also rated high (or low) in school classrooms. Of course, this doesn't prove that microteaching is better than school experience nor is it intended to. It does, however, strongly suggest that microteaching is a useful preliminary to school experience. Students agree with this. As part of one study, a year group of students anonymously completed a questionnaire after their school experience, which included questions on the value of microteaching. Nearly 90 per cent of them ($n=56$) considered microteaching to have been a valuable experience, and the most beneficial aspect was considered to be the opportunity to see themselves teach. Although students' attitudes, in themselves, are not a sufficient justification for a programme, they are important if the programme is to succeed. Combined with the findings described in this article, they are strong evidence in favour of microteaching, as it is practised at Ulster, as a mode of training.

Nonetheless, we are not complacent about the programme and we continue to research and develop it. We are now turning our attention to lesson planning and performance and to different models of teacher effectiveness. Preliminary results suggest that careful planning yields more examples of higher level thinking in teachers' *and* pupils' discourse. The work on contrasting models of teacher effectiveness shows that teachers who are judged as good on one model are not necessarily good when judged in terms of another model. For example, if the criterion of good teaching is performance on the skills of the microteaching programme given in the lesson appraisal guide, then the 'good' students *tend* to be those who are socially extroverted, intelligent, convergent and systematic thinkers, as well as being enthusiastic. If the criterion used is creative and novel teaching, then the social extroverts are not 'good' teachers, but the introverted divergent thinkers tend to be.

This finding is a useful corrective to those who fear (or hope) that microteaching will markedly affect the personalities of intending teachers. It shows how central processes of the trainees

set limits on the efficacy of a programme. Within those limits our research indicates that microteaching does produce changes in students' teaching behaviours and, perhaps more important, in their perceptions and understanding of the teaching process.

Trends 1975/1

The Keller Plan

Systems of programmed instruction appear to offer some solutions to common pedagogic problems. In this article the author describes how one such system has been used in some higher education courses.

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The individual learning method known as the Keller Plan, or Personalized System of Instruction, is being increasingly tried in British polytechnics and universities. The basic features are not new since similar methods were used in schools in England in the 1830s and in the USA in the 1910s. The method was developed in its present form for higher education by an American psychologist, Professor Fred Keller, who used it at the University of Brasilia in 1964. He continued to develop it at the University of Arizona and summarized it in a paper in 1968.* The method has since become known as the Keller Plan and its use has expanded considerably in the Americas. Many subjects, among them the sciences, engineering, mathematics, computing, the social sciences, nursing, history, languages and speech communication have now been presented in this way. Although estimates vary, the number of such courses in the USA is perhaps 1,000 to 2,000. The method was first used in the United Kingdom at the University of Surrey in 1971. This review outlines the method, summarizes some of its features, and describes its use at Lanchester Polytechnic.

The Keller Plan

The Keller Plan is based on Skinnerian reinforcement theory and the main principles are mastery, individual pacing, and repeated instant feedback. The basic premise is that every student should demonstrate mastery of all sections of a course, since an imperfect understanding of a number of small points could lead to the

* KELLER, F. S. Good-bye, teacher . . . *J. of Applied Behaviour Analysis*, 1968, **1**, 79 - 89.

misunderstanding of major concepts. Since students work at different rates, each must work at his or her own pace, which means that the course material cannot be presented by lectures since these would set a pace. The material must therefore be in written form, on film, videotape, or audiotape, or in a computer, where it can be studied at any time convenient to the student. To assess the students' mastery, tutors are available, one for every ten students, to mark and discuss tests and to help with individual difficulties. (Hence the alternative name, the Personalized System of Instruction, or PSI). In the USA tutors are often students who have recently completed the course; in Britain they are usually lecturers or postgraduate students.

In practice a course is divided into units of about a week's work. For each unit the student is given a study guide which lists the behavioural objectives of the unit, suggests study procedures —for example, reading, viewing film loops, carrying out an experiment—and suggests some self-assessed problems. Open University study guides would be excellent for the Keller Plan; the Open University does not, however, use this study method since, first, it does not demand mastery of one unit before proceeding to the next; second, the study pace is laid down at, for example, one unit per week for a full-credit course; and, third, the feedback time of about fourteen days, though good in the circumstances, is not immediate.

Students can work when and where they like; they do not have to attend regular classes. The normal class periods are used for unit assessment and individual tutoring. When a student thinks he has mastered the unit, he takes one of the three or four tests for the unit, randomly chosen. There is no time limit for the test which should take about twenty minutes. As soon as the test is finished it is marked by a tutor in the student's presence, giving immediate feedback. For mastery the answers should be completely correct, but in practice the tutor decides after considering the answers and discussion together whether or not the student knows the material. The completed test is retained by the tutor.

If the student passes, he is given the study guide for the next unit. If not he does further work and takes another test. There is no penalty for not passing but he must ultimately pass before proceeding to new work. There is usually an examination at the end of the course, although courses are sometimes assessed on the unit tests alone. The mark for the course is a combination of the examination mark and a course-work mark determined by the proportion of units passed.

Questionnaires and discussions show that the majority of students like this method of learning. A few do not. The features most liked seem to be the individual pacing, with the consequent freedom of study, and the one-to-one personal tuition. Student response in a course at Lanchester Polytechnic is discussed below.

Procrastination

Although students can work at their own pace rather than be forced into a set lecture pace regardless of ability, there is a desirable rate of progress set by the examination date. In effect, students must work different numbers of hours per week to maintain reasonable progress, though they have the advantage of working at times convenient to themselves. The main problem with individually paced courses is that students do not maintain the desirable rate of progress and fail to complete the units in time for the examination. Perhaps, as suggested in Willoughby and Boud's findings on Keller Plan courses at the University of Surrey,* this method highlights the problem that there is generally too much material in most courses to enable them to be mastered fully. In practice, students are usually given the study guides for the uncompleted units several weeks before the examination and often cover most of the material, though not at the level of complete mastery.

In the USA procrastination often results in students withdrawing before the end of the course or being awarded 'incompletes' which allow them to complete the course in the following semester. These possibilities are not usually available here and methods of reducing procrastination are perhaps more important. Green† recommends (a) handing out a list or graph giving target dates for passing units, (b) displaying a chart showing the number of units passed by each student, (c) making the passing of each unit count a little towards the final course mark, (d) offering an early final examination to those who finish the units early, and (e) offering occasional lectures on fringe material outside the syllabus to students who are on schedule. He admits, however, that the last device has rarely worked for teachers other than Professor Keller.

Keller Plan courses at Lanchester Polytechnic

The present author and Mrs. Carol Beech used the Keller Plan in Lanchester Polytechnic from February to June 1974 in an integrated mathematics/physics module on the joint first year of the new BSc degree courses in physical science and materials technology. The module, nominally of six hours per week for fifteen weeks, was divided into eighteen units. There was a small laboratory/demonstration element in the module which for the Keller Plan was incorporated as film loops and simple self-demonstrations on fundamental points, available at all times when the laboratories were open. The test/tutorial room was open for the six hours per week normally scheduled for the module. A chart of units passed by all students was on display. Students were

* WILLOUGHBY, L. and D. J. BOUD. Paper presented to the conference on Changing Science Courses, held at Thames Polytechnic, London, in December 1973.

† GREEN, B. A. Workshop on the PSI. Institute of Physics Education Group Conference held at the University of Surrey in 1973.

given graphs of target dates for passing units and calendars on which to record tests passed and not passed. Passing the units could contribute up to twenty marks (the figure specified for course work in the course scheme) and the examination up to eighty marks towards the total for the module.

Of the twenty-one students, six completed all eighteen units, a further seven completed at least sixteen units, and a further four at least fourteen units; two completed only nine. The average examination mark was 66 per cent and only one student failed (he has since passed a re-sit examination). After the students had received their examination results, which included module grades, they were asked to complete a questionnaire anonymously. Nineteen replies were received. On average the students thought that they spent about seven hours per week on the module, though individual replies ranged from two to fifteen. If the lecture/tutorial method had been used, the students would have spent six hours per week in class and two or three hours doing problems and consolidation work, no doubt longer for weaker students.

The most emphatic answer was that the students liked having the objectives of the module written out precisely. The study guides and reading materials were considered an adequate substitute for lectures and they found target dates useful in gauging their progress. The students were in little doubt that immediate marking of the unit tests was beneficial to their study, but were not sure whether the unit tests informed them that they had mastered the material. This last doubt was also found by Willoughby and Boud* at Surrey. To the statement 'I should like to take other modules using the Keller Plan', seven students answered 'definitely yes', ten answered 'yes' and two answered 'no'. Asked to give on a 1 to 5 scale the proportion of a degree course which they would prefer to study by lectures (1) or by the Keller Plan (5), the overall average was 2·9 (3 represents half-and-half).

The Keller Plan experiment on that first-year module of the BSc courses in physical science and materials technology was considered successful. This session, 1974-75, three first-year modules are being studied by this method. In the Department of Applied Sciences, one module of the second year of the physical science course and an electronics course in the final year of the Higher National Diploma in Applied Physics are also being studied by this method.

In the Coventry part of the Polytechnic during the last session, Dr. T. Pyle and Dr. V. Rollins of the Metallurgy Section have used the Keller Plan for a 24-hour course on corrosion in the final honours year of the degree course in Metallurgy and Mr. D. W. Mears of the Faculty of Art and Design has also used it successfully with fifteen students in each of four sixteen-hour

* op cit.

Liberal Studies' modules on 'Viking Ships' and 'The Viking Expansion Westward to Iceland, Greenland and North America'.

Conclusions

The use of the Keller Plan is expanding slowly in Britain. At least eight universities and five polytechnics are trying the method. The lecturer's role has changed from his being a broadcaster of information to being the designer and manager of a learning system which can make full use of written and other audio-visual material. He finds, though, that the initial implementation of this type of course requires a great deal of time and effort in the preparation of study guides and tests. The student, instead of being forced into a set lecture pace regardless of his abilities, can study at the pace which he requires to master the material. He receives personal tuition at the very least each time he takes a test, as if he were in a class of one, with the result that his failings show up very early in the course when remedial action can be taken.

You write . . .

12 Hillfoot Road
Liverpool 25

Dear Sir,

The October 1973 edition of TRENDS IN EDUCATION contained an article on the work of the remedial service in Hounslow.

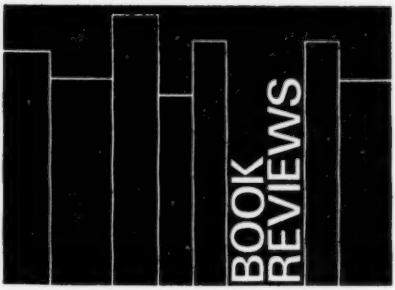
I would hope that such an article would not be deemed typical of the work being carried out by such services throughout the country, representing as it does a somewhat unenlightened approach to the prevention of difficulties in reading.

This was particularly evident in the infant 'screening' which was carried out by a group of medical officers, audiometricians, speech therapists, and psychologists—no mention being made of a teacher being involved in the process.

Whilst we persist in this quasi-medical approach to solving the problem of reading failure, we have virtually no chance of ameliorating—let alone solving—the problem.

Yours faithfully,

M. WALSH



Returning to teaching: a report on a DES-sponsored investigation

Kathleen Ollerenshaw and Christine Flude

Councils and Education Press (10 Queen Anne Street, London W1M 9LD)

£1·50 (by post £1·65)

In this interesting and valuable report Dame Kathleen and her co-author have plotted for us the extent and distribution of the reservoir of women, trained as teachers and now ready to return to schools after a period at home bringing up a family, which the training system has been steadily accumulating during past years. She has gone further in showing how we can calculate just how many such teachers would be available in any one year and by what steps and procedures we can bring them back to full and efficient service. Her report, in fact, provides for administrators at local and national level a most useful guide on an important element in teacher supply.

One senses an unusual degree of rapport between Dame Kathleen and the subjects of her study. This springs in part from her own strong and active interest in the field of education and from the evident sympathy and concern she has for the teachers. But on their side, too, the teachers appear to show an eagerness to take part in the exercise, clear evidence of their anxiety to return to the schools. This emerges most strongly in that section of the report based on telephone conversations with 160 of the respondents. This use of the telephone was a novel technique for such an enquiry and appears to have been most rewarding. It certainly brought into the document a good measure of what the newspapers call 'human interest' and, in consequence, makes it that much more readable.

Dame Kathleen presses the case for the continued employment of the married woman returner. In this she would have much support both in the schools and amongst the employers. One fears, however, that their return to teaching may become increasingly difficult as the financial capacity of local authorities to expand their teaching force declines and as the training system adjusts itself to the falling demand. It is unfortunate, as the report shows, that the supply of potential returners is greatest in those areas where the demand is most easily met: the university towns are singularly rich in their teacher resources.

That the valuable skills and strong feeling for their work which so many of these women offer should be dissipated in frustrated idleness is greatly to be regretted; we can only hope that ways may be found to ensure that some, at least, will continue to reinforce the work of the schools.

P.P.

Practical approaches to careers guidance

Catherine Avent

Careers Research and Advisory Centre

£3·20

Growing interest in the development of careers work in schools has led to the publication recently of a small number of much needed books to which this is a welcome addition. Catherine Avent combines experience as a careers officer with a very wide knowledge of guidance in schools as the first Inspector for careers guidance appointed by an LEA.

The first short section of the book sets out for secondary school heads some of the reasons for developing a structure of careers guidance able to meet pupils' needs in the present open

and changing society, and it suggests some of its possible and desirable features. The next hundred pages are primarily directed to careers teachers ('careers tutors' is the author's preferred title). The possible content of careers education as part of the curriculum, including aspects which can be covered within traditional subject areas, is considered at useful length. Further chapters outline the role of the careers service, suggesting some ways of integrating it into an overall guidance pattern in the school, and propose ways of securing help from 'extramural' resources, including employers and colleges of FE; audio-visual aids to careers work and the organization and techniques of interviewing and the use of texts and questionnaires are also briefly considered. The place of careers conventions, works visits and various sorts of work experience and similar activities are examined with much helpful detail, as are some means of helping pupils to understand what higher and further education provide. There is a short chapter on the role of parents in guidance, and two stimulating pages on careers guidance in further education colleges conclude the book, with a trailer for one that still needs writing.

The book is as accurately entitled 'practical' as it is commendably short. Heads will find it even includes many questions that can be usefully asked at interviews of potential careers tutors. It can hardly fail to help these essential staff members when they are appointed by providing them with ideas for development, sometimes with problems for solution and sometimes with options among which to choose. Miss Avent constantly suggests possibilities; she rarely provides solutions, though she does strongly favour an educational and vocational guidance department in every secondary school (with its own head) providing some services but also coordinating the contributions of a sizeable careers team.

H.E.S.M.

Everything but Alf Garnett: a personal view of BBC school broadcasting

Kenneth Fawdry

BBC Publications £4·50

Using broadcasts in schools: a study and evaluation.

C. G. Hayter

BBC Publications/The Independent Broadcasting Authority £0·90

The BBC has been producing a service of broadcasts to schools for fifty years. The occasion is commemorated by Mr. Fawdry's book which in a lively manner not only recounts the development of school broadcasts over the years, but describes their present and potential range and scope, explains how they are originated and produced, and how they are continuously adapted to the response from the schools. He writes as a teacher who, because he has mastered the media, finds himself teaching a class of hundreds of thousands instead of one of thirty, and in this way reflects the enthusiasm and expertise of several generations of brilliant men and women who have worked for school broadcasting.

From the earliest days the BBC has agreed to produce and distribute only those programmes which are sponsored by the School Broadcasting Council, and for nearly fifty years schools have benefited from the work of this independent curriculum development group funded by the man-in-the-street through his receiving licence. Perhaps more notice might have been taken by other curriculum development organizations of the experience accumulated during half a century of school broadcasting. Even though the best advice about the needs of schools is gathered from all who are concerned, the most able teachers engaged, the most attractive material produced, it still remains true that many teachers do not want to use the product, or use only parts of it, or use bits of it in ways which were never intended by the originators.

Why more schools do not make more use of broadcasts is a question which has been argued constantly, and Mr. Fawdry records some of the earlier discussions. The results of the latest enquiry, sponsored jointly by the BBC and the IBA, are contained in Mr. Hayter's book. Some 106 schools known to be interested in using broadcasts, and to be reasonably well equipped to do so, recorded over a period of two years their experience of using broadcast material. Eleven case studies, written by the teachers concerned, detail the work done with varying ages of children in differing types of school. Mr. Hayter carefully documents the views of teachers from all the contributory schools, emphasising the elements which have significance for success or failure. Clearly, to use broadcasts well is no easy task. The successful teacher appears to be one who is flexible, willing to do additional preparation, and to have a certain amount of skill in the use of broadcasts: he needs to be supported by an organization which provides adequate equipment, decently maintained.

Mr. Hayter notes that teachers are asking for access to yet more material in that they would like to use the output of general broadcasting as well as the programmes for schools, and that they feel unfairly limited by the restrictions on recording and copying contained in the present law of copyright. This demand for unlimited access, for educational purposes, to all materials becomes more insistent as we move rapidly to the time when both sound and video recorders will be numerous in schools and when the character of school broadcasting itself may change. Mr. Fawdry examines fully the implications of, for example, using broadcasting as a distribution service providing material to be stored and used at will by the receiving schools.

But it is not evident, either from Mr. Hayter's survey or Mr. Fawdry's book, that schools could make effective use of a greater volume of material, live or recorded. The problem of utilization remains and is not solely a problem of the use of broadcast material. Schools have still to find out how to organize all the resources they now have and how to store, retrieve and use others which will pour into their recorders as technology makes distribution easier and copyright becomes more flexible. Effective answers to this complex problem would immensely improve the quality of teaching and learning and pay handsome dividends on the effort expended.

H.J.E.

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